



April 11, 1965 Palm Sunday Tornado Outbreak

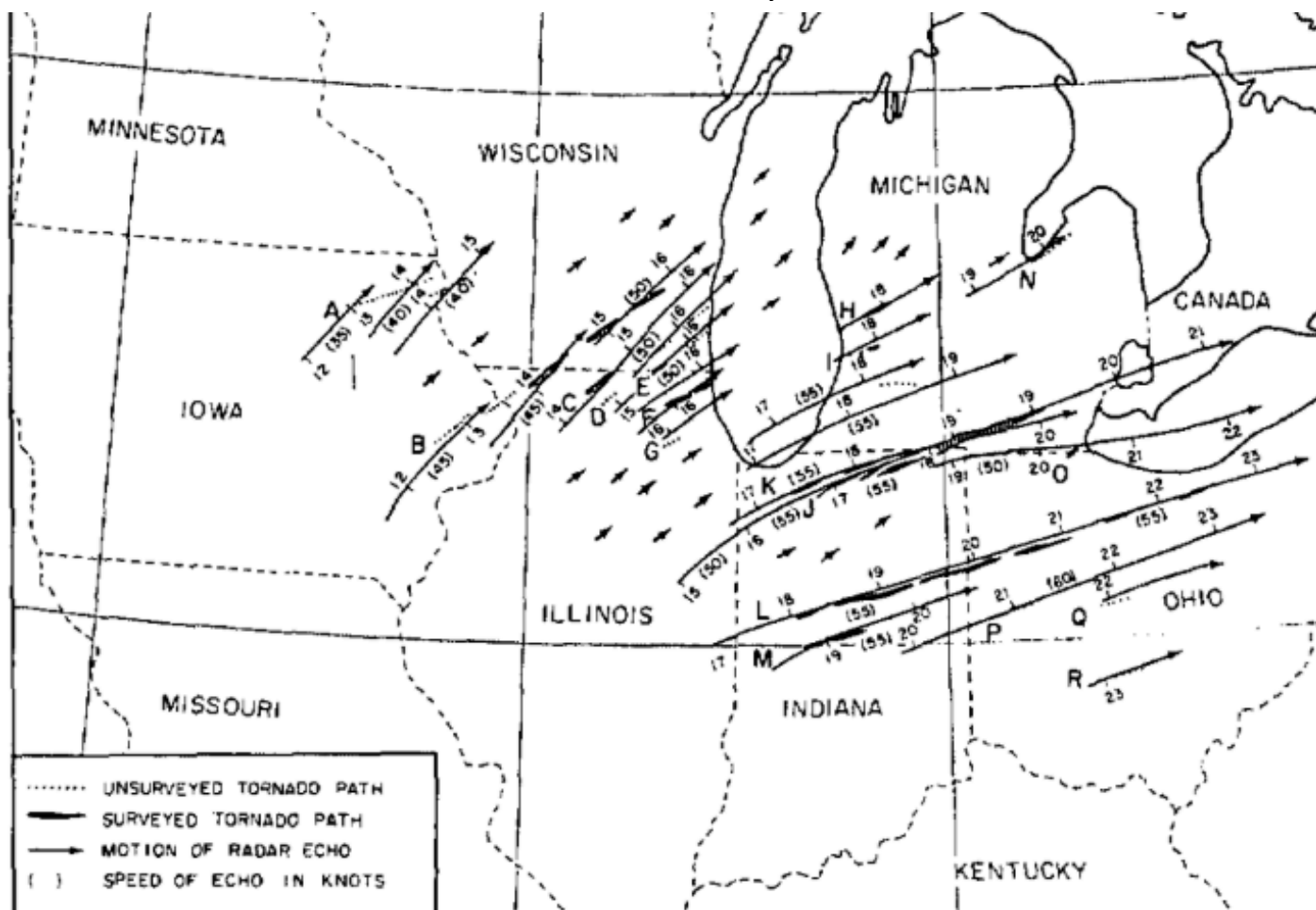
This storymap is a tribute to the victims and survivors of the deadliest tornado outbreak in history to strike the Great Lakes region.

National Weather Service

Overview

A historic outbreak of severe thunderstorms occurred on the afternoon and evening of April 11, 1965 across the Midwestern United States. At least thirty-seven tornadoes formed during the calendar day on April 11, changing the lives of the thousands and incurring over a billion dollars in damage. Several more tornadoes were reported across the Midwest and Southeast on April 10 and 12. The April 11 event coincided with the Christian observance of Palm Sunday, giving it the well-known name of the Palm Sunday tornado outbreak. While the 1965 Palm Sunday outbreak proved costly to both lives and property, it played a pivotal role in changing the United States Weather Bureau's (now National Weather Service) understanding and approach to forecasting severe thunderstorms and tornadoes. This story map revisits the 1965 Palm Sunday tornado outbreak, and the impact that it had on severe weather forecasting in the years following.

Event By The Numbers



6

Number of states impacted by at least one tornado on April 11, 1965 (Illinois, Indiana, Iowa, Michigan, Ohio, and Wisconsin).



17

Number of violent (F4/EF4 or F5/EF5) tornadoes recorded on April 11, 1965. All tornadoes were rated F4 on the Fujita Scale.

This figure stands as the ***second-highest*** number of violent tornadoes recorded during a single day in United States history. Only the April 3, 1974 Super Outbreak saw more (30).



1,100

Approximate distance (in miles) covered by the paths of the at least 37 tornadoes documented on April 11, 1965. The total path length is comparable to a drive between Chicago & Denver (1,004 miles) and a flight between Seattle & San Diego (1,063 miles).

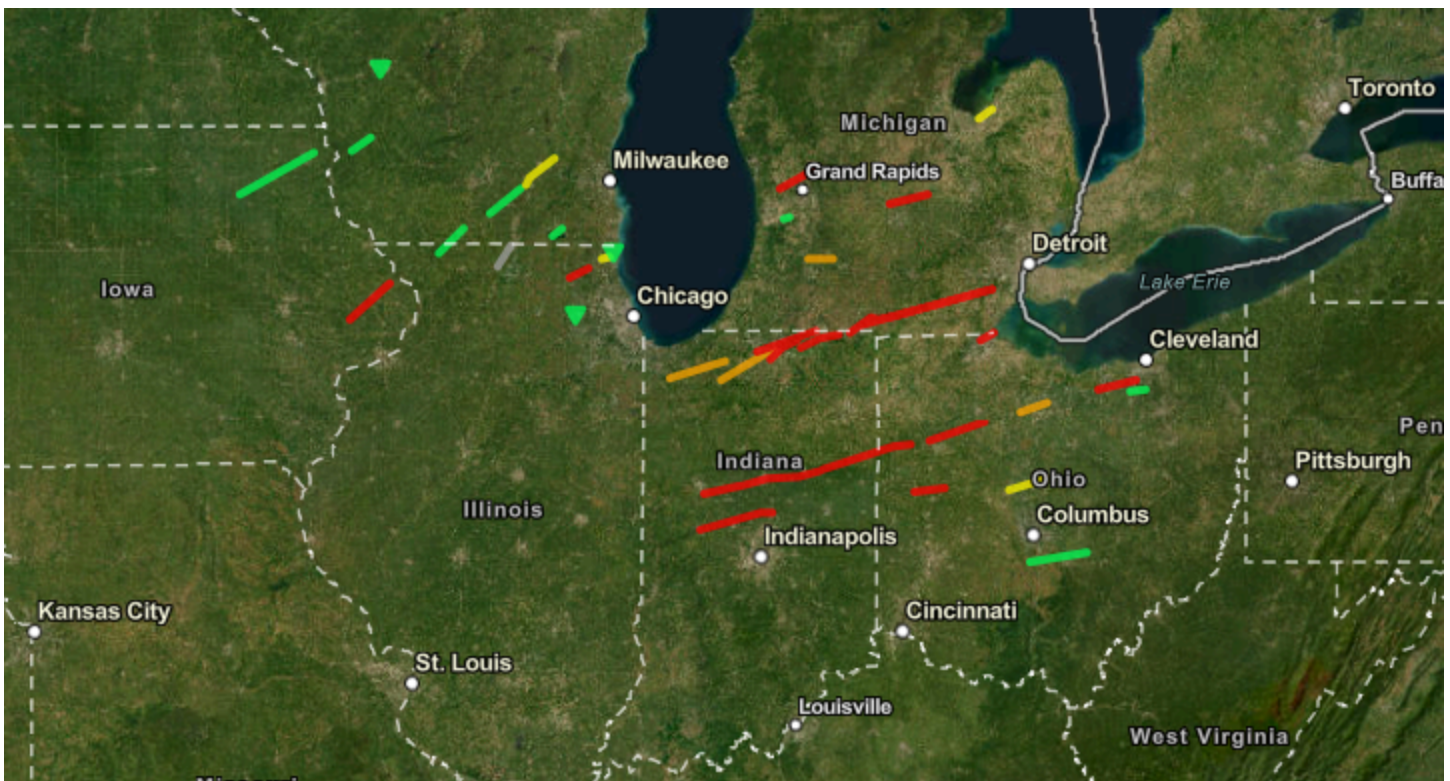


1,191,000,000

Cost, in 1965 U.S. dollars, of total property damages resulting from the outbreak. Adjusted to 2025, this total falls just shy of 12 billion dollars.

Interactive Tornado Map

Below is an interactive map of the known tornado paths documented during the April 11, 1965 Palm Sunday tornado outbreak. Tracks were imported from official databases housed at the National Center of Environmental Information & the Storm Prediction Center. Paths surveyed in [Fujita 1970](#) were manually edited for better approximate accuracy. Note that due to the age of this dataset, tornado tracks are not precise. Some NWS offices---particularly WFO Grand Rapids---are in the process of officially correcting some of these imperfections through the use newspaper articles, photographs, and other known first-hand accounts.



Earthstar Geographics | NOAA, NCEI, Storm Prediction Center, NWS Milw...

100 mi  Powered by Esri

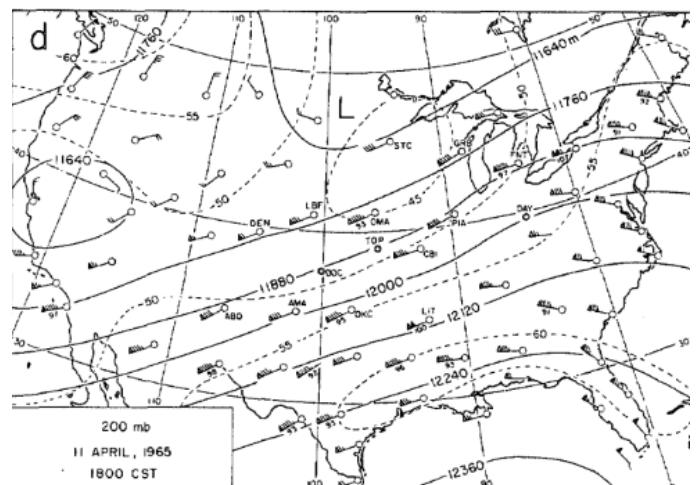
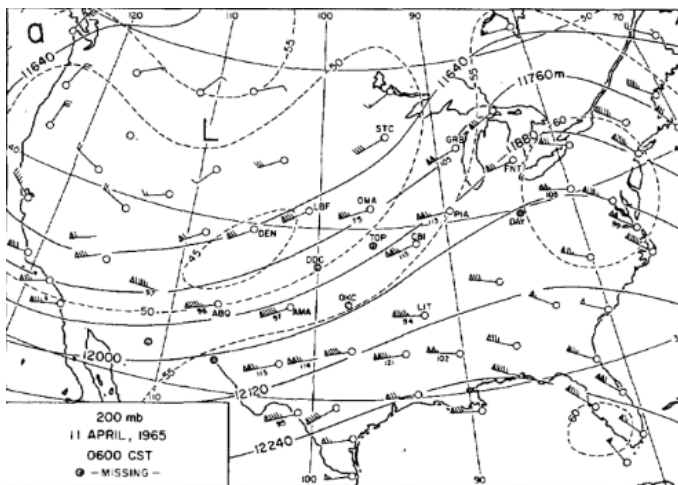
Meteorology

For the purposes of reanalyzing the environment available on April 11th, 1965, observations from that time were fed into a modern forecast model (ERA5) in order to get data on the evolution of the system that produced the historic outbreak.

Large Scale Environment

The environment on the morning of April 11th, 1965 indicated several areas of potential widespread lift in the upper levels of the atmosphere, setting the stage for widespread convection and potentially dangerously strong thunderstorms.

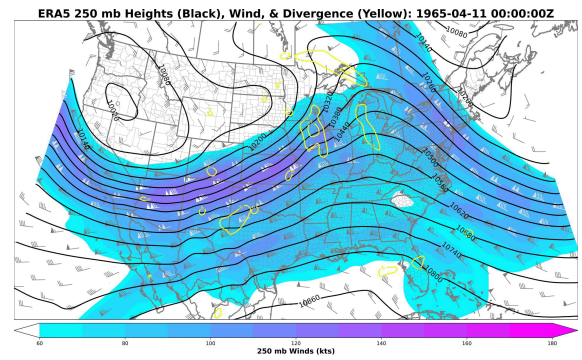
Upper Levels



Analysis of 200 mb jet stream wind observations, showing jet stream winds streaming into the Great Lakes Region.

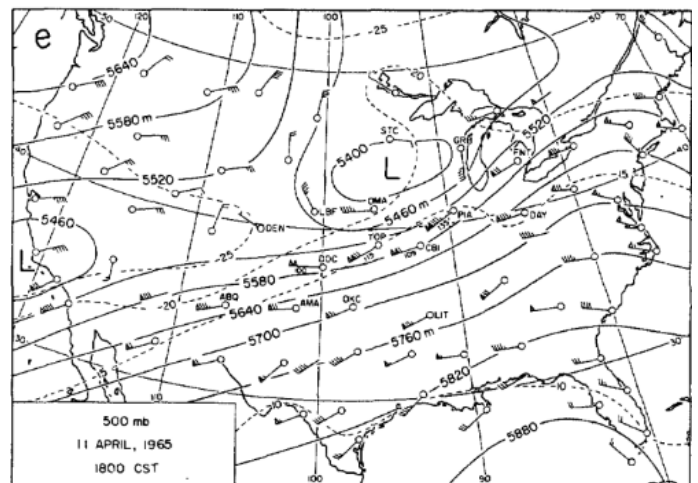
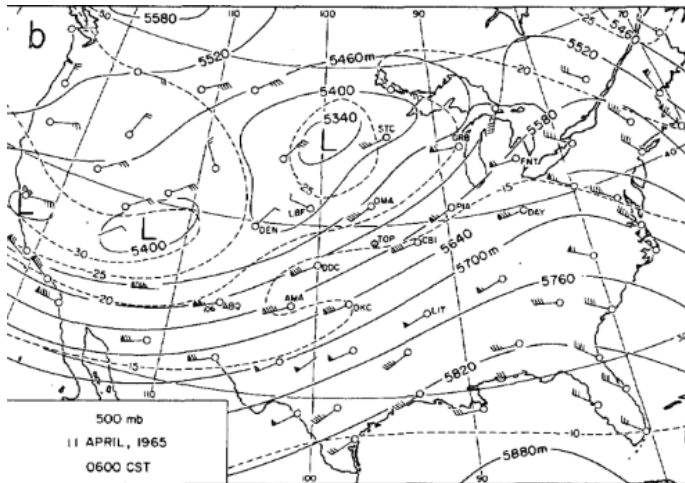
At 6:00 AM CST/7:00 AM EST on April 11th, observations at 200 mb (around the jet stream level) were analyzed across the U.S., showing very fast moving air around 115 knots (~130 mph) nudging into northern Illinois and southern Wisconsin. This jet would produce widespread lift across the Great Lakes Region throughout the day. By 6:00 PM CST/7:00 PM EST, the jet is seen weakening and exiting across Michigan and New York.

Meteorologists look to divergence aloft to determine whether an environment is supportive for storms. High divergence in the upper atmosphere acts as a sort of "vacuum cleaner" in the atmosphere to create rising motion. In the reanalysis charts, significant divergence (in yellow) is seen near the jet stream level across northwestern Iowa, southern Wisconsin, and northern Illinois in the early afternoon hours, developing farther into northern Indiana, southern Lower Michigan, and northern Ohio during the mid afternoon to evening hours.



ERA5 output for the evolution of the 250 mb jet stream (blue and purple shading) and divergence (yellow contours) from the morning of April 11th, 1965 through the overnight hours.

Mid Levels

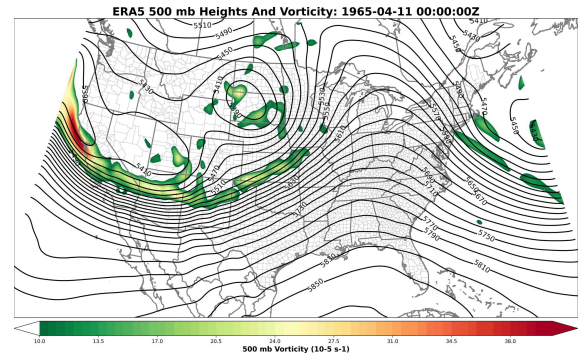


Analysis of 500 mb troughs and ridges, showing a trough digging into the Great Lakes Region.

In the mid-levels of the atmosphere (~500 mb), meteorologists hone in on troughs (upper level lows) indicating areas of cold air that can lead to rapid growth of thunderstorms. The morning of April 11th, 1965, a trough is seen over the Northern Plains, with fast moving air to its southeast indicating it will progress northeastward and bring that rapid growth potential into the Great Lakes. By the evening hours,

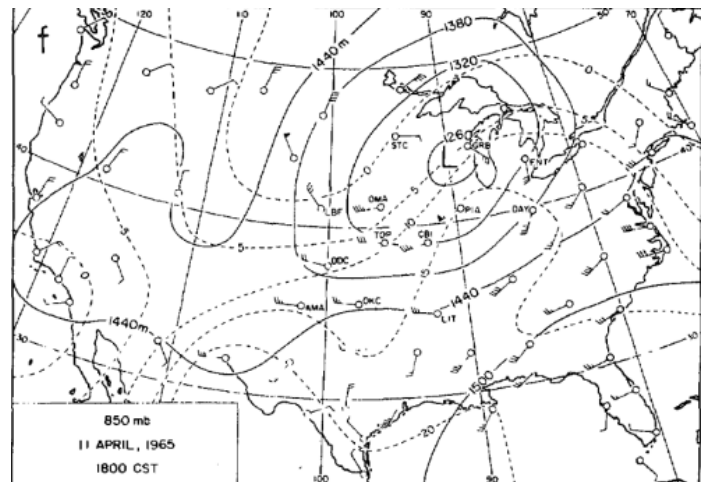
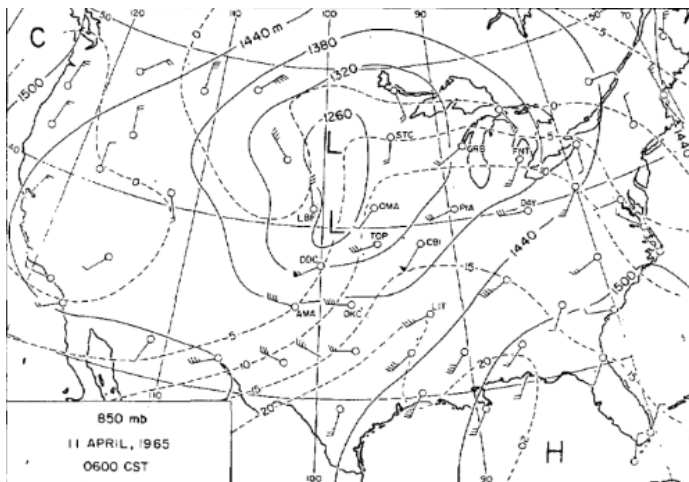
the trough is seen over southern Wisconsin, with additional divergence seen into Michigan and northern Ohio.

Model reanalysis at the same level shows this trough moving into the Upper Midwest during the afternoon hours, bringing rapidly cooling air into the area. Vorticity, a measure of how much vertical spin is available, is also shown. Increasing vorticity over an area indicates additional rising motion; this can be seen in the reanalysis from western Iowa and southern Wisconsin through northern Illinois/Indiana/Ohio and southern Michigan over the course of the afternoon on April 11th, 1965.



ERA5 output for the evolution of 500 mb ridges and troughs from the morning of April 11th, 1965 through the overnight hours.

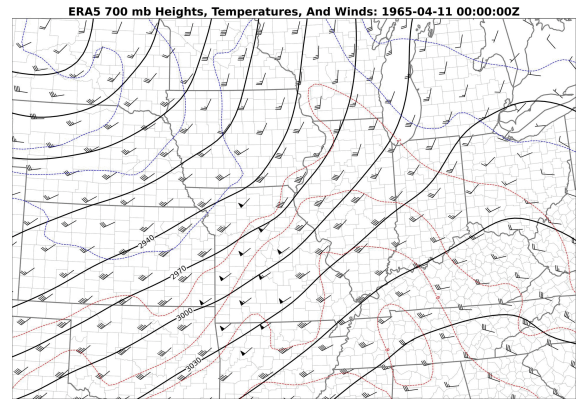
Lower Levels



Analysis of 850 mb lows and highs, showing a strengthening low moving eastward into the Great Lakes Region.

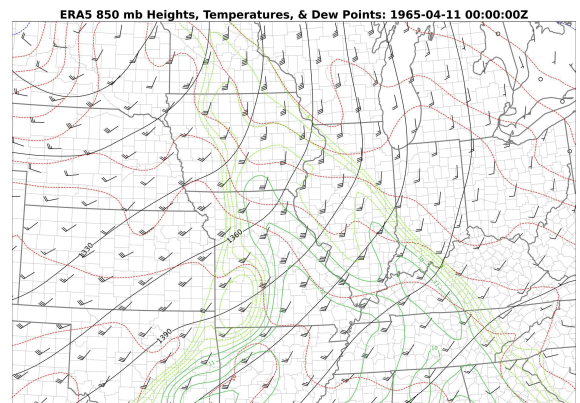
In the lower levels of the atmosphere (700 mb to 850 mb), attention focuses on moisture and temperatures, although winds remain very important as well. In the morning hours of April 11th, observations show strong southwesterly winds ahead of a low at 850 mb, which bring moisture and warm air northward into the Great Lakes region.

Temperatures changing over time and space at 700 mb indicate potential for enhanced lift and rapid thunderstorm growth potential. Colder temperatures shown in blue dotted lines on the right start moving eastward during the mid to late afternoon hours (1900Z to 0500Z, or 1-11 PM CST/2 PM - 12 AM EST). Precursory warm temperatures shown in red indicate that temperatures will be rapidly cooling into the afternoon and evening hours, leading to potential rapid thunderstorm development, dependent on available moisture.



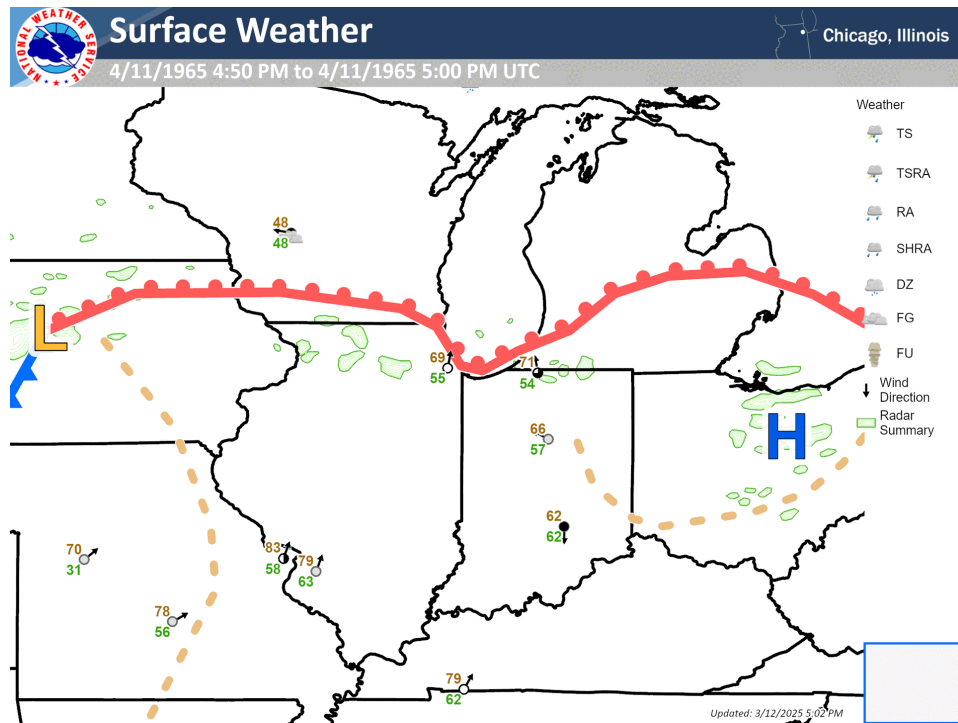
ERA5 output for the evolution of temperatures (red and blue dotted lines), winds (black barbs), and heights (black lines) from the morning of April 11th, 1965 through the overnight hours.

Reanalysis charts at the 850 mb level indicate the 850 mb low over the Northern Plains bringing strong southwesterly winds, warm temperatures, and plenty of moisture into the Great Lakes region. With this influx of moisture, two of the three ingredients (lift, moisture, and instability) for significant thunderstorms are met. An interesting transition develops during the late evening to overnight hours in northern Indiana, southern Michigan, and northern Ohio, as a strong low level jet develops with wind speeds up to 80 knots (~90 mph). Low level jets such as this one enhance low-level shear and therefore thunderstorm strength.



ERA5 output for the evolution of temperatures (red and blue dotted lines), winds (black barbs), heights (black lines), and dew point temperatures (green lines) from the morning of April 11th, 1965 through the overnight hours.

Surface



A loop of surface features, showing temperatures, dewpoints, warm fronts, cold fronts, dry lines, and generalized radar output based on observations from April 11th, 1965. The loop goes from 11 AM CST/12 PM EST (5 PM UTC) to 9 PM CST/10 PM EST (3 AM UTC).

Research done shortly after the event by Tetsuya T. Fujita, Dorothy L. Bradbury, and C.C. Van Thullenar indicated the presence of local features that drove severe weather development the day of the Palm Sunday outbreak. One of the primary features was what is now called a dry line, but Fujita et. al. called a "dry cold front". This feature occurs where warm and moist air forms a boundary against warm and dry air. Since moist air is more buoyant than dry air, this can result in thunderstorm development as the boundary moves. This well-defined boundary moves eastward with time on April 11th, becoming a trigger to the afternoon thunderstorms.

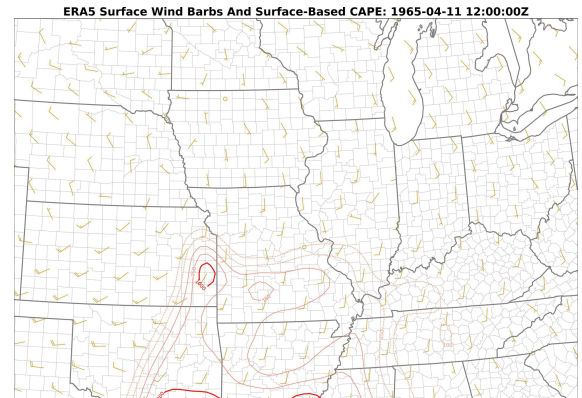
Regional Environment

With upper level lift, low level enhancement, and surface fronts in place, the last bit of environmental analysis must be calculated from layers on a regional scale. The primary way that meteorologists get an idea of the vertical structure of the

environment is through soundings, or weather balloons. Multiple parameters can be calculated from the data these balloons collect, including instability (CAPE), how much winds change with height (shear), and how much spin is available to a developing storm (helicity). Modern model analysis (ERA5) was carried out on observed soundings from the day of the outbreak to better show these additional parameters as well.

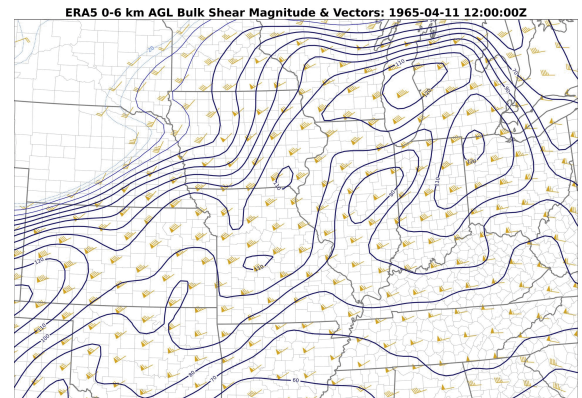
Instability

Surface-based CAPE indicates how unstable air is if it is lifted from the surface up through the atmosphere. High CAPE values indicate potential for rapid thunderstorm development and higher chances for severe weather. On April 11th, 1965, a surge of high instability is indicated through CAPE values of 1000 to 2000 J/kg across the Mississippi Valley into southwestern Wisconsin, as well as across Illinois, Indiana, southern Michigan, and Ohio.



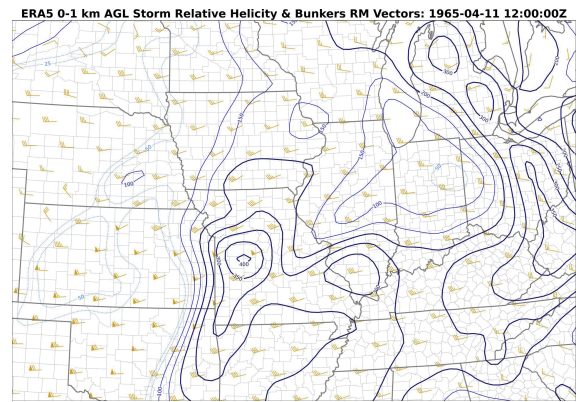
Shear

How much winds increase with height indicates the potential for thunderstorm longevity. The higher the shear, the better the ability of thunderstorms to continue to grow as they move. How much winds change between the surface and 6 km is indicated in bulk shear graphics. On April 11th, bulk shear values of 80 to 120 kt are seen across eastern Iowa, southern Wisconsin, Illinois, Indiana, Michigan, and western Ohio.



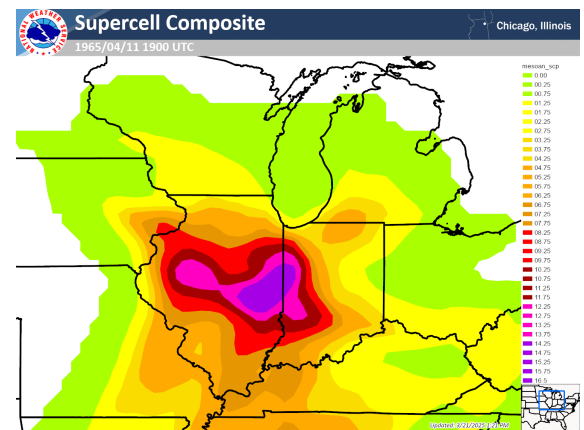
Helicity

Helicity measures how much spin is available to a thunderstorm, potentially leading to supercells and tornadoes. Storm relative helicity is a measure of the spin available to an already moving storm. High values of helicity are seen across eastern Iowa, southern Wisconsin, central to northern Illinois and Indiana, southern to central Lower Michigan, and western Ohio.



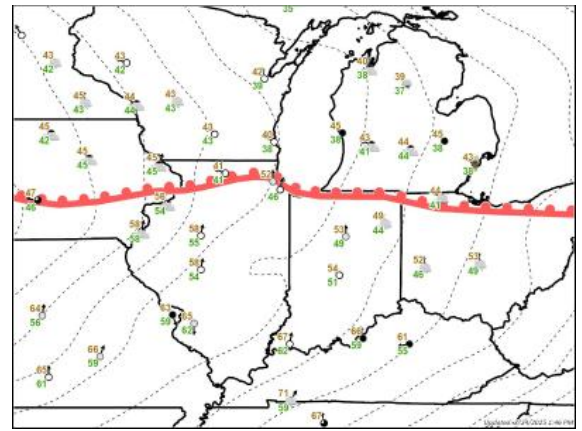
The End Result: An Atmosphere Highly Conducive For Supercells & Tornadoes

Meteorologists can use forecast indices & parameters to quickly identify areas favorable for severe weather. These indices/parameters use complex formulas to combine known severe thunderstorm ingredients into a single number. Greater numbers imply greater severe weather potential. One index is the Supercell Composite (SCP), which multiplies instability, shear, and helicity together to form a single number quantifying how favorable the atmosphere is for supercells & potential tornadoes. Given the high amounts of overlapping instability, wind shear, and helicity, very high SCP values were in place across the outbreak area during the afternoon & evening hours of April 11, confirming a highly favorable environment for supercell thunderstorms and possible tornadoes.



Event Progression

At 6:00 AM CST/7:00 AM EST on April 11, 1965, a warm front extended from west to east across the southern Great Lakes region. A low pressure area was located near the Missouri River border of Iowa and Nebraska. Throughout the day, this warm front would generally drift slowly northward, with the area of low pressure moving eastward into the region. Following along with the low pressure area, a strong dry line would push eastward, becoming the focusing mechanism for multiple clusters of severe thunderstorms.



8:40 AM CST/9:40 AM EST

The Severe and Local Storms Unit (SELS), predecessor to today's Storm Prediction Center (SPC), issued a thunderstorm outlook for the following 24-hour period.

SELS indicated a large area atmospheric instability expected from Texas northeastward into southern Illinois, and another area centered near Ohio and western Pennsylvania. They forecasted a large area as being favorable for thunderstorm activity covering areas from the southern Great Plains states eastward to the Great Lakes and Appalachian states. They forecasted two areas as being favorable for severe thunderstorms, one from northeastern Texas northeastward into southern Illinois, and another from eastern Indiana eastward into western Pennsylvania and West Virginia.

SEND FOLLOWING MESSAGE TO:

APR 11 09 35 '65

DEPT. OF COMMERCE
WEATHER BUREAU

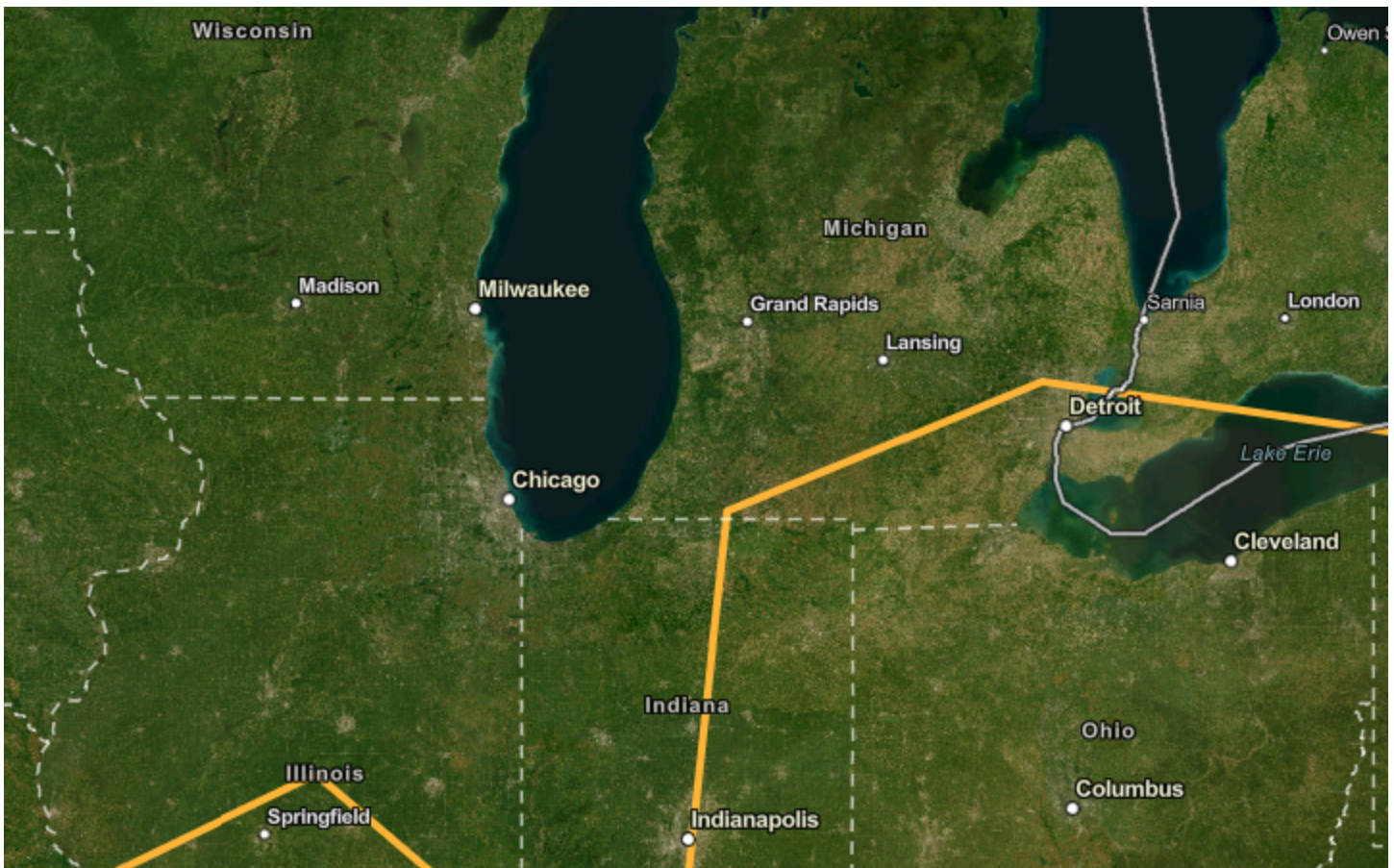
ALSYM A MKCC 110840

MKC SELS SYNS 110840

SEE WW NR 103

AT 500 MB CLZD LO EXPCD OVR THE NEV UTAH AREA WITH S/W FM MINN SWD INTO NRN ARK BY 18C TDA. HI LVL JET EXPCD FM SRN ARIZ NEMD THRU OKLA INTO CNTRL ILL AND EWD INTO MD. SECOND JET EXPCD FM WRN TEX EWD THRU NRN LA INTO SRN GA. LO LVL MOISTURE EXPCD FM SRN TEX NWD THRU CNTRL ARK INTO SRN MO AND EWD THRU THE OHIO VLY INTO OHIO. MOST UNSTBL AMS EXPCD ASSOC WITH LO LVL MOISTURE EXPCD FM N CNTRL TEX NEMD THRU ARK INTO SRN ILL WITH SECOND AREA OF MOST UNSTBL AMS OVR OHIO W VA AND WRN PA. TSTM ACTVITY NXT 24 HRS EXPCD TO BE WDLY SCTD UNDER 500 MB LO OVR PTNS OF SRN ARIZ WRN ARIZ ERN NEV AND UTAH. WDLY SCTD TSTMS ALSO EXPCD TO THE RIGHT OF A LINE FM SERN TEX NEMD INTO THE TEX PHDNL NEMD THRU IA AND ERN MINN CONTD FM NRN NY SWD THRU ERN PA INTO THE ATLANTIC CONTD FM SC WWD THRU CNTRL ALA INTO SERN TEX. MOST NMRS AND ACTV TSTMS WITH SCTD ACTVITY REACHING SVR LIMITS EXPCD FM THE E CNTRL PTN OF W TEX NEMD THRU N CNTRL AND NE TEX CNTRL AND ERN OKLA ARK EXTRM SE KANS SRN MO SRN ILL AND THE W PTNS OF KY AND TENN. SECOND AREA OF ACTV TSTMS WITH ISOLD ACTVITY APRCHG SVR LIMITS EXPCD OVR PTNS OF ERN IND EWD THRU OHIO WVA AND WRN PA.

CRITES



Earthstar Geographics | National Weather Service Severe Local Storms unit microfilm archives, digitized by Scot... Powered by Esri

The area where numerous tornadoes would develop later in the day was on the edge of the forecasted severe weather area.

10:45 AM CST/11:45 AM EST

SELS issued a "Tornado Forecast" - a product known today as a Tornado Watch - for portions of eastern Missouri, central Illinois, and western Indiana. Just 15 minutes later, another Tornado Forecast was issued for portions of northern Arkansas, southeastern Missouri, southern Illinois, and western Kentucky, just to the south. Each of these products were valid from 1:00 PM to 7:00 PM CST (2:00 PM to 8:00 PM EST).



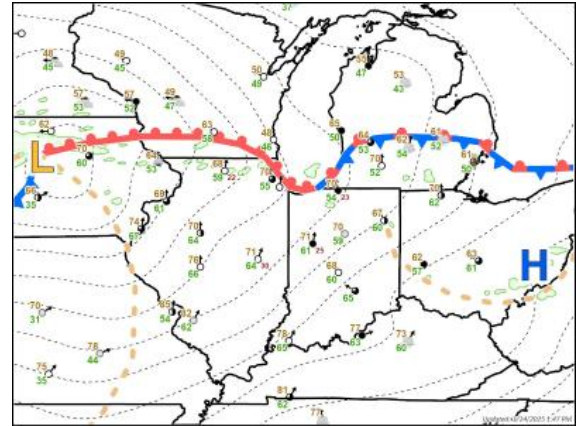
Earthstar Geographics | Natio... Powered by Esri

Map showing area highlighted by SELS Severe Weather Forecasts 66 & 67 issued at 10:45 AM CST (11:45 AM EST) and 11:00 AM CST (12:00 PM EST), respectively, on April 11, indicating areas at risk for tornadoes.

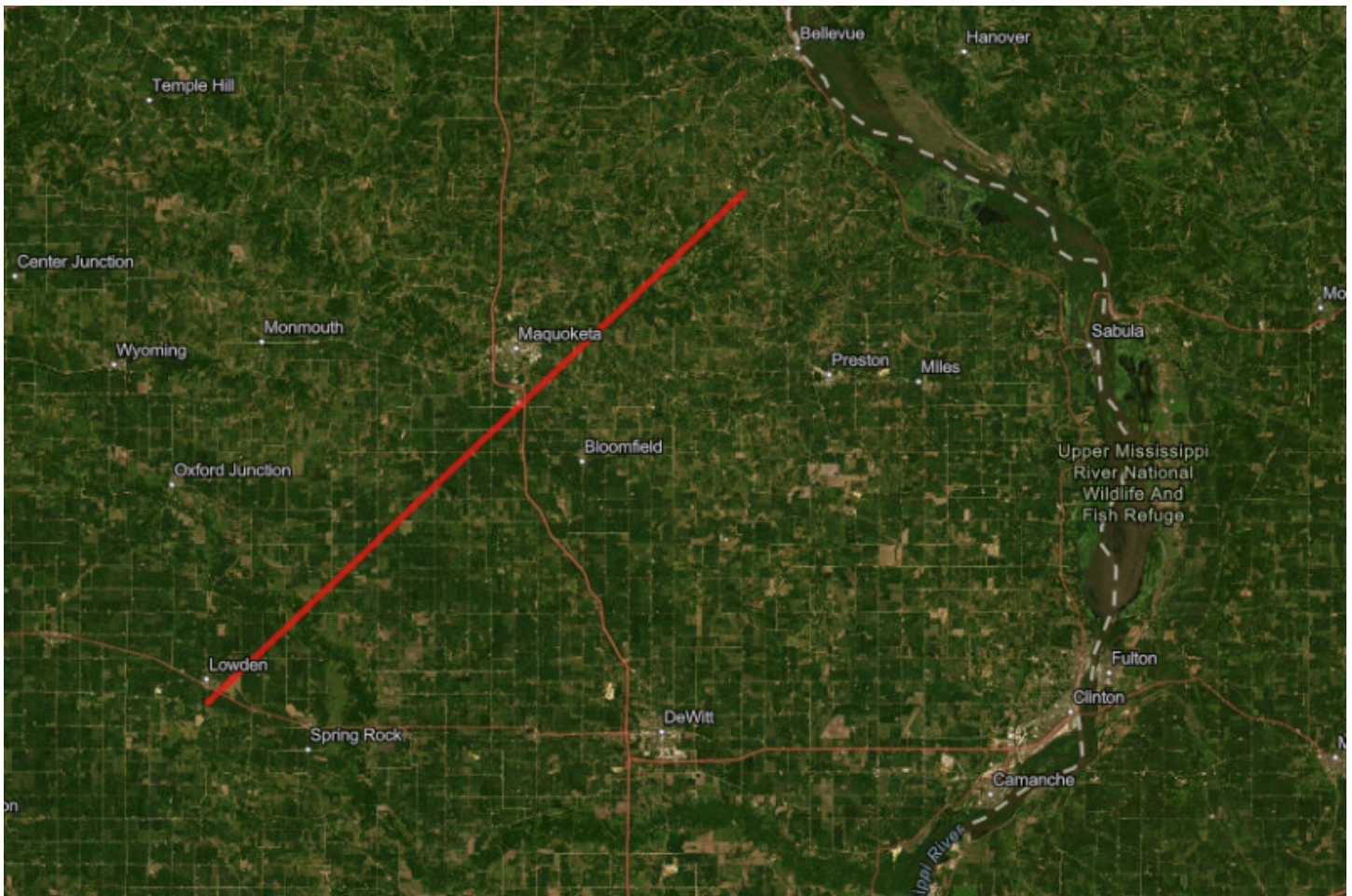
Forecasters at SELS indicated that scattered severe thunderstorms were expected in these areas with large hail,

damaging winds, and several tornadoes.

By 12:00 PM CST/1:00 PM EST, the surface warm front had moved slightly northward into Wisconsin and Michigan, with a section briefly stalled near Lake Michigan. The area of low pressure had moved into north central Iowa, with the associated dryline moving quickly eastward into eastern Iowa and Missouri.



Scattered showers were ongoing near the warm front, and thunderstorms had just begun to form east of the dry line, but north of the Tornado Forecast areas, in Iowa.



12:45 PM CST/1:45 PM EST

The first tornado of the day---rated F4 on the Fujita Scale---began near Lowden, Iowa. The tornado continued northeast toward the communities of Toronto, Elwood, Maquoketa, and Springbrook.

1:00 PM CST/2:00 PM EST

SELS issued a Tornado Forecast for portions of eastern Iowa, northern Illinois, and southern Wisconsin. This product was valid from 1:00 PM CST to 6:00 PM CST (2:00 PM to 7:00 PM EST).

Forecasters at SELS indicated that a few severe thunderstorms were expected in this area with large hail, damaging winds, and a couple tornadoes.



Earthstar Geographics | Natio... Powered by Esri

Map showing area highlighted by SELS
Severe Weather Forecast #68 issued at
1:00 PM CST/2:00 PM EST on April 11,
indicating an area at risk for tornadoes.

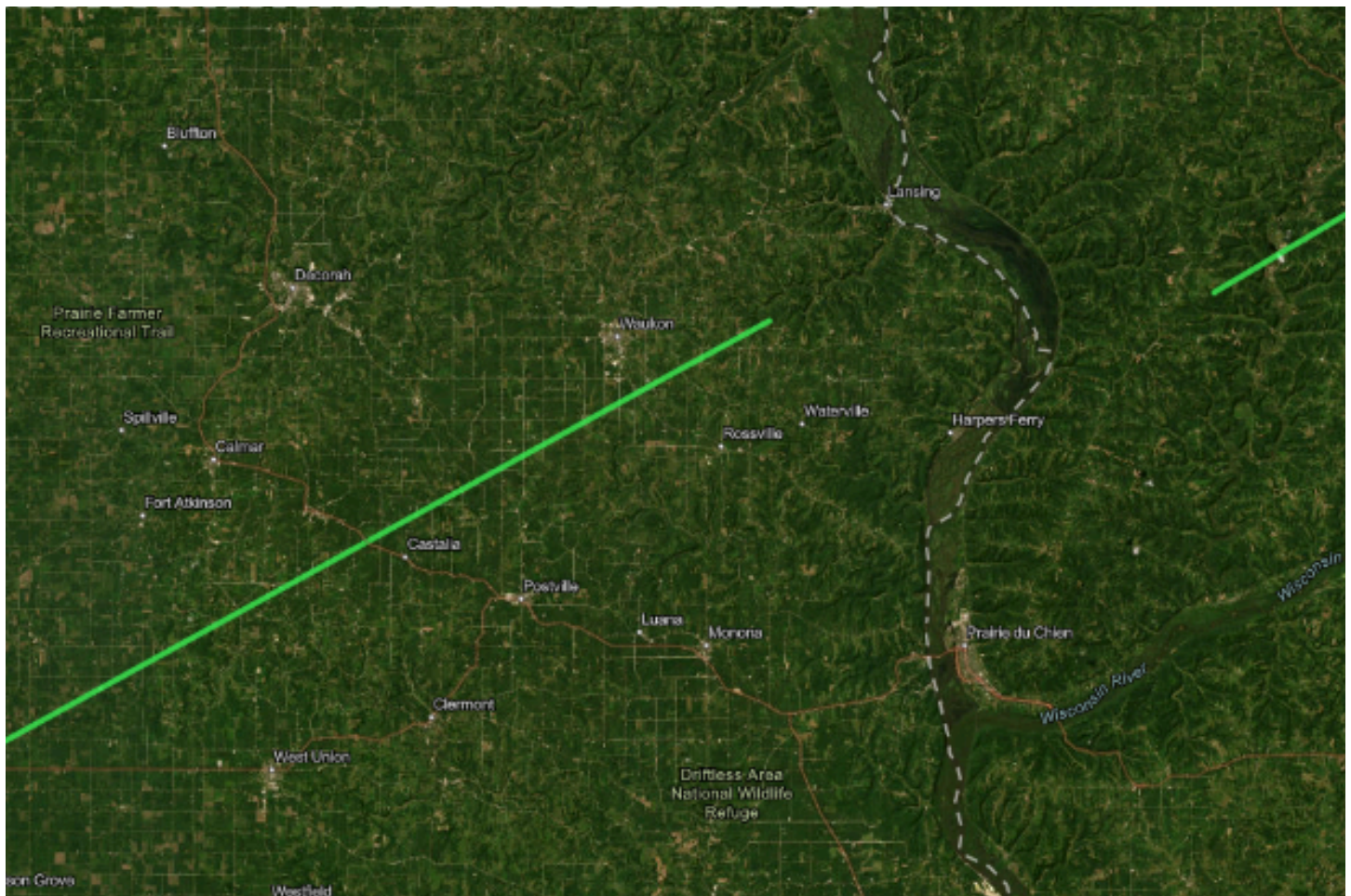
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SEVERE WEATHER FORECAST NUMBER 68
ISSUED 100 PM CST APRIL 11 1965
U.S. WEATHER BUREAU TORNADO FORECAST FOR...

EXTREME SOUTHERN WISCONSIN
EXTREME EASTERN IOWA
PORTIONS OF NORTHERN ILLINOIS

A FEW SEVERE THUNDERSTORMS WITH LARGE HAIL DAMAGING WINDS AND ONE OR TWO
TORNADOES ARE EXPECTED FROM 1 PM UNTIL 6 PM CST THIS SUNDAY AFTERNOON AND
EVENING IN THE AREA BOUNDED BY THE POINTS 40 MILES SOUTH OF BURLINGTON
IOWA TO 50 MILES WEST OF LONE ROCK WISCONSIN TO MILWAUKEE WISCONSIN TO
40 MILES SOUTH EAST OF CHICAGO ILLINOIS BACK TO THE POINT 40 MILES SOUTH
OF BURLINGTON IOWA.

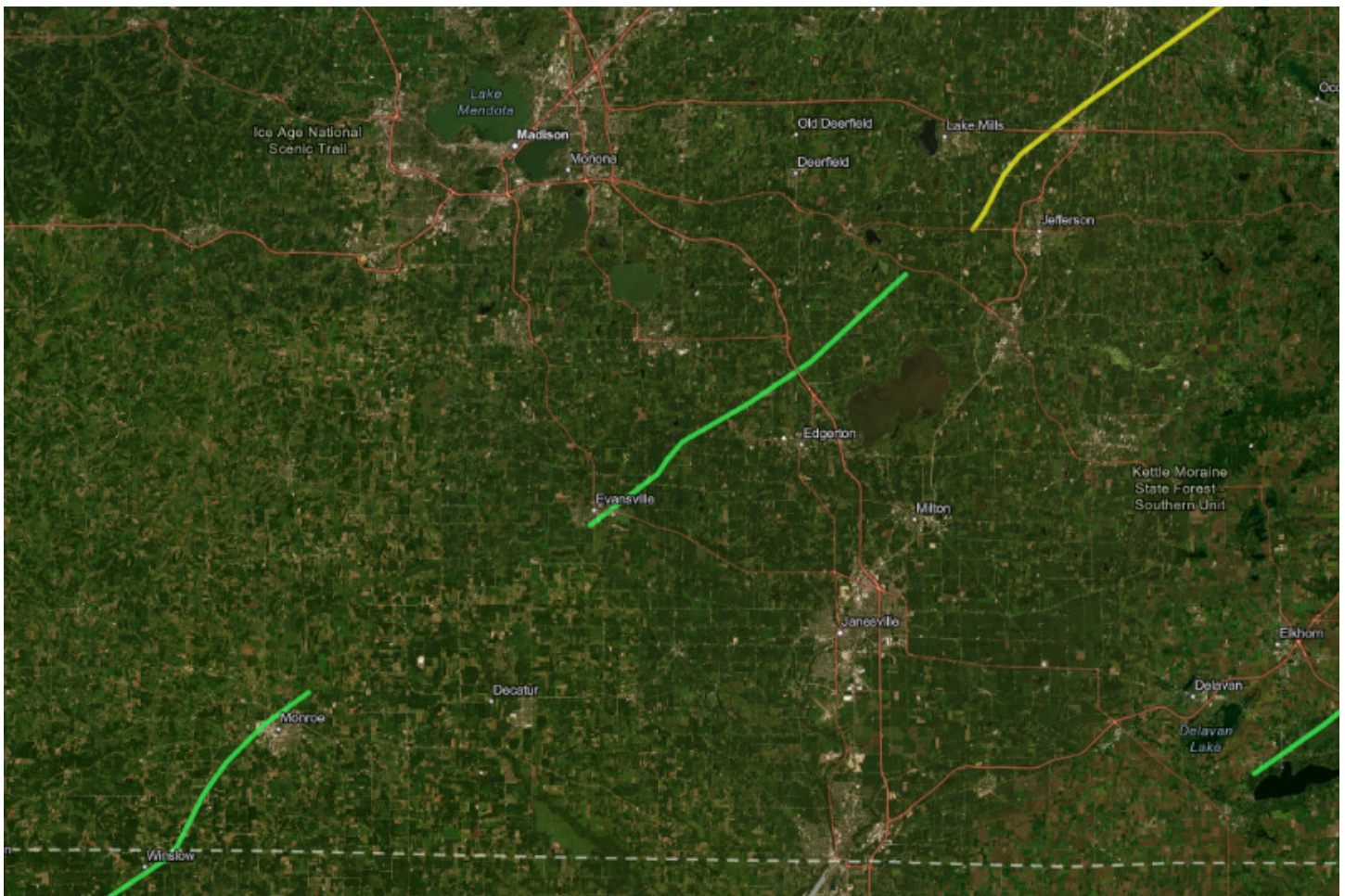
WOOD....1906Z
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Text discussion for SELS
Severe Weather Forecast #68.



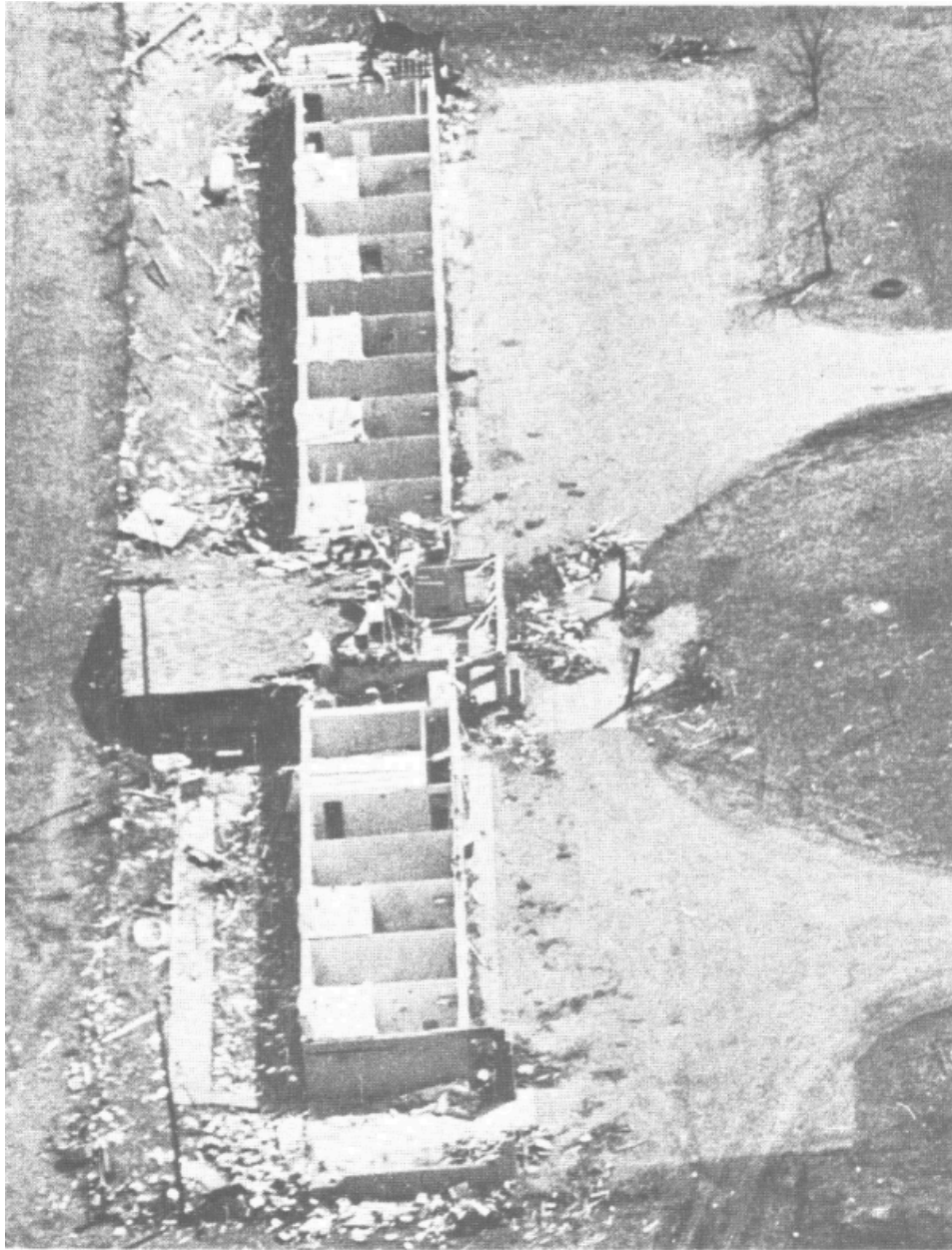
Shortly after 1:00 PM CST/2:00 PM EST, a storm produced two tornadoes along a path from northeastern Iowa to southwestern Wisconsin:

- An F1 tornado began near Fredericksburg, Iowa, around 1:15 PM CST/2:15 PM EST. This tornado continued northeast toward the Castalia and Waukon areas.
- An F1 tornado began south of Fairview, Wisconsin, around 2:45 PM CST/3:45 PM EST. This tornado continued northeast toward Montgomeryville and North Clayton.



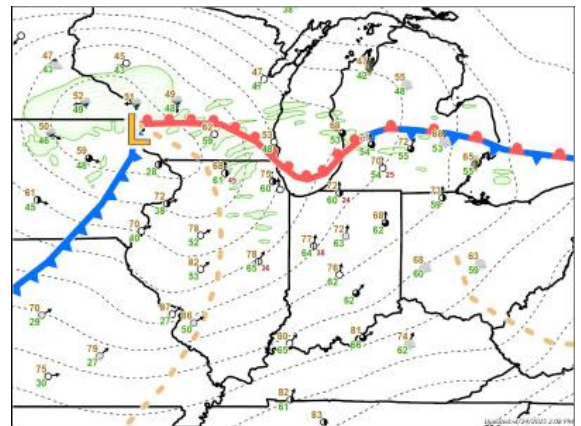
At approximately 2:00 PM CST/3:00 PM EST, the storm that produced the F4 tornado in Iowa continued northeastward across parts of Illinois and Wisconsin, producing three additional tornadoes:

- An F1 tornado began near Waddams Grove, Illinois, around 2:00 PM CST/3:00 PM EST. This tornado continued northeast toward the Winslow area and then moved into southern Wisconsin. The tornado continued northeast through the Monroe area.
- An F1 tornado began near Evansville, Wisconsin, around 2:55 PM CST/3:55 PM EST. This tornado continued northeast toward Stebbinsville and Albion, and then dissipated north of Lake Koshkonong.
- An F2 tornado began west of Jefferson, Wisconsin, around 3:30 PM CST/4:30 PM EST and then moved northeast toward Watertown, Pipersville and Sugar Island.



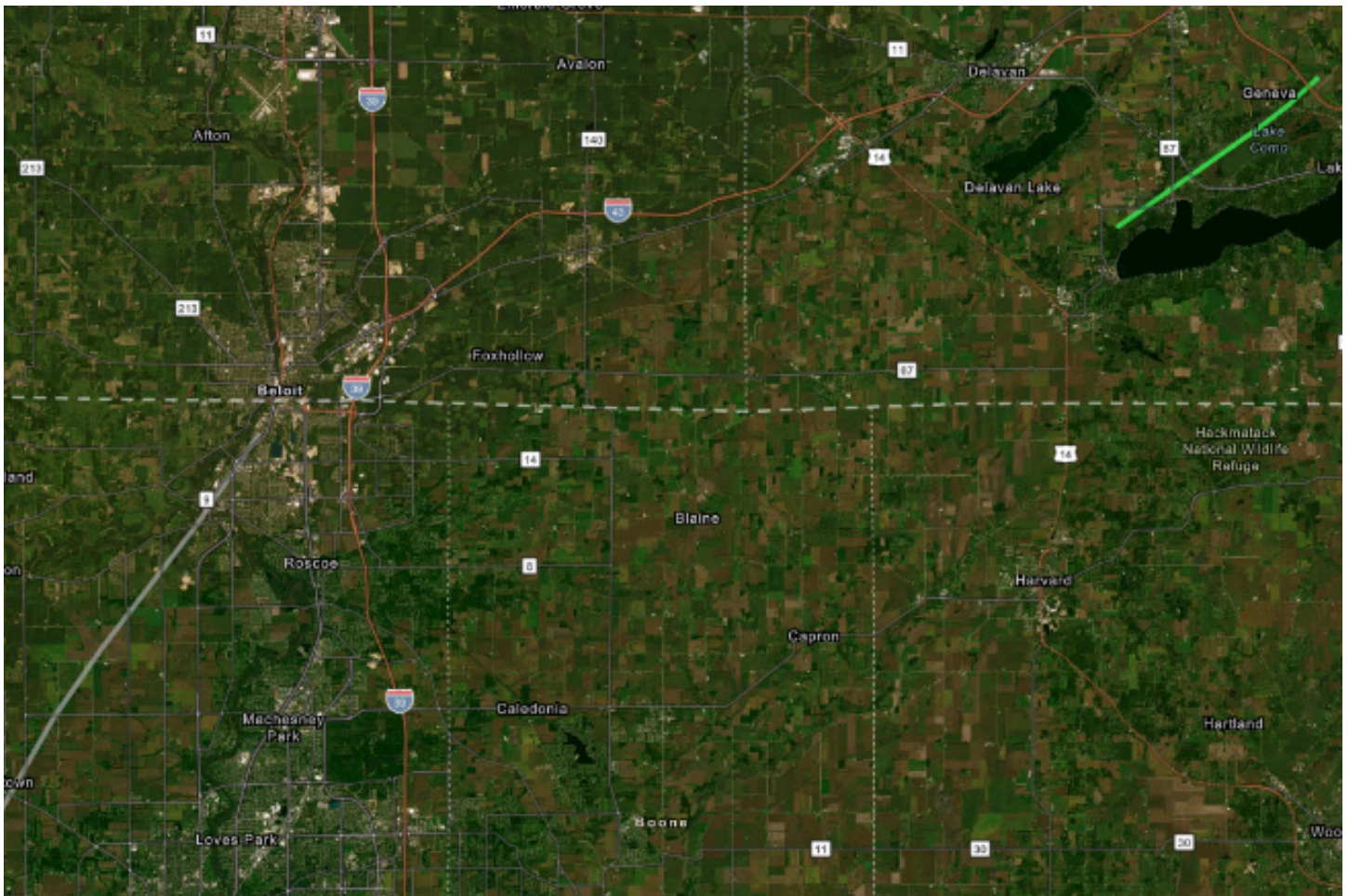
Damage to a motel along WI-69 on the north side of Monroe, WI.

By 3:00 PM CST/4:00 PM EST, the surface warm front had reached south central Wisconsin, with the eastern end stalling in central Michigan. The area of low pressure had reached the Mississippi River near the Iowa/Wisconsin border, with the associated dryline entering south central Wisconsin and north central Illinois.



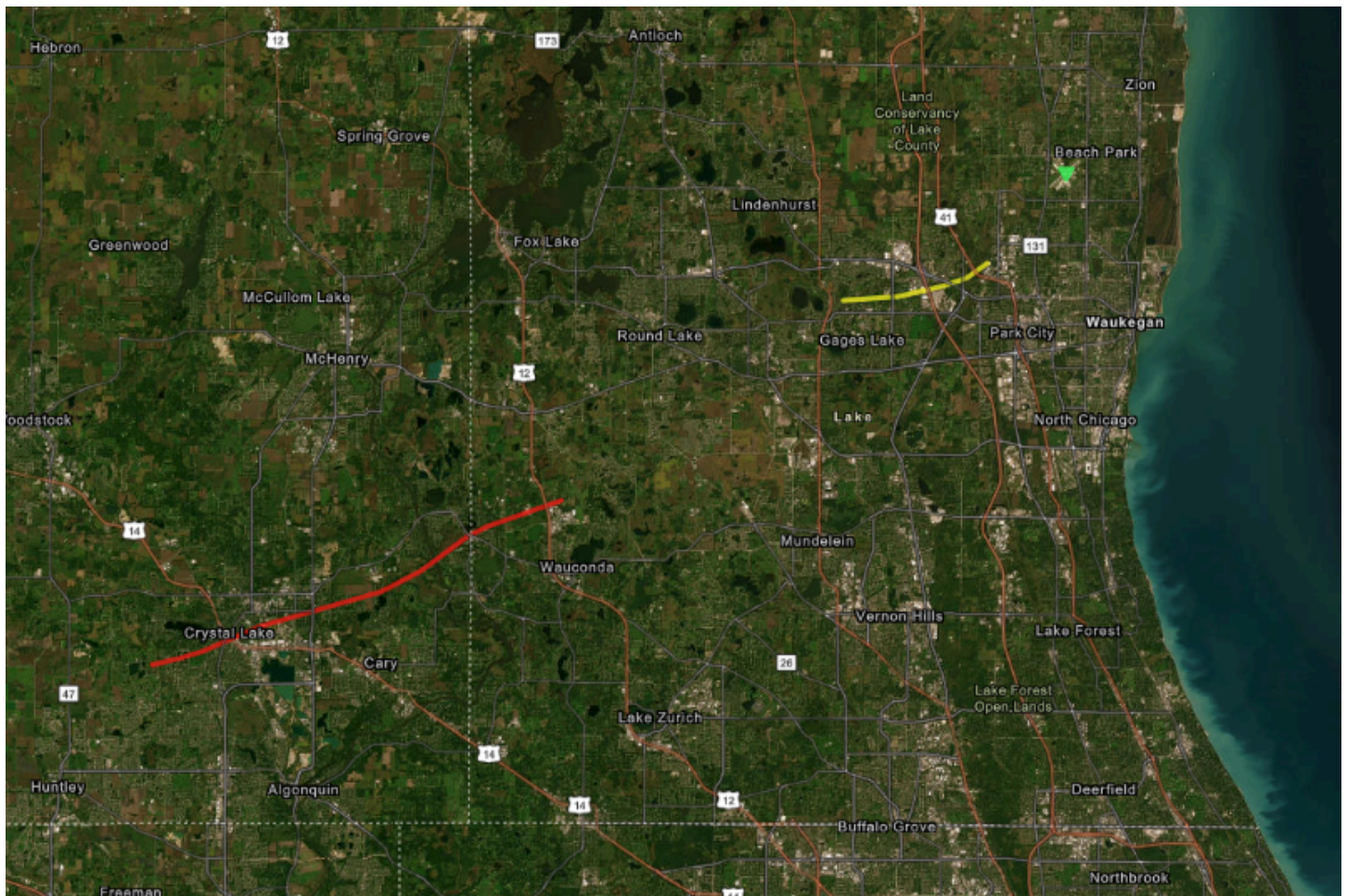
Surface weather features at 2100 UTC (3:00 PM CST/4:00 PM EST) on April 11, 1965.

Multiple thunderstorms were ongoing just east of this dry line in Wisconsin and Illinois.



South of the tornado-producing storms in south-central Wisconsin, a separate storm produced brief tornadoes in northern Illinois and southern Wisconsin after 3:00 PM CST/4:00 PM EST.

- A tornado of unknown rating began northwest of Rockford around 3:00 PM CST/4:00 PM EST, then moved northeastward toward Wempleton and Rockton. This tornado hit the Wagon Wheel Lodge south of Rockton, damaging the roof the pool house and causing injuries.
- An F1 tornado began near Lake Como around 3:30 PM CST/4:30 PM EST. This tornado had a brief track through the Lake Geneva area before dissipating.

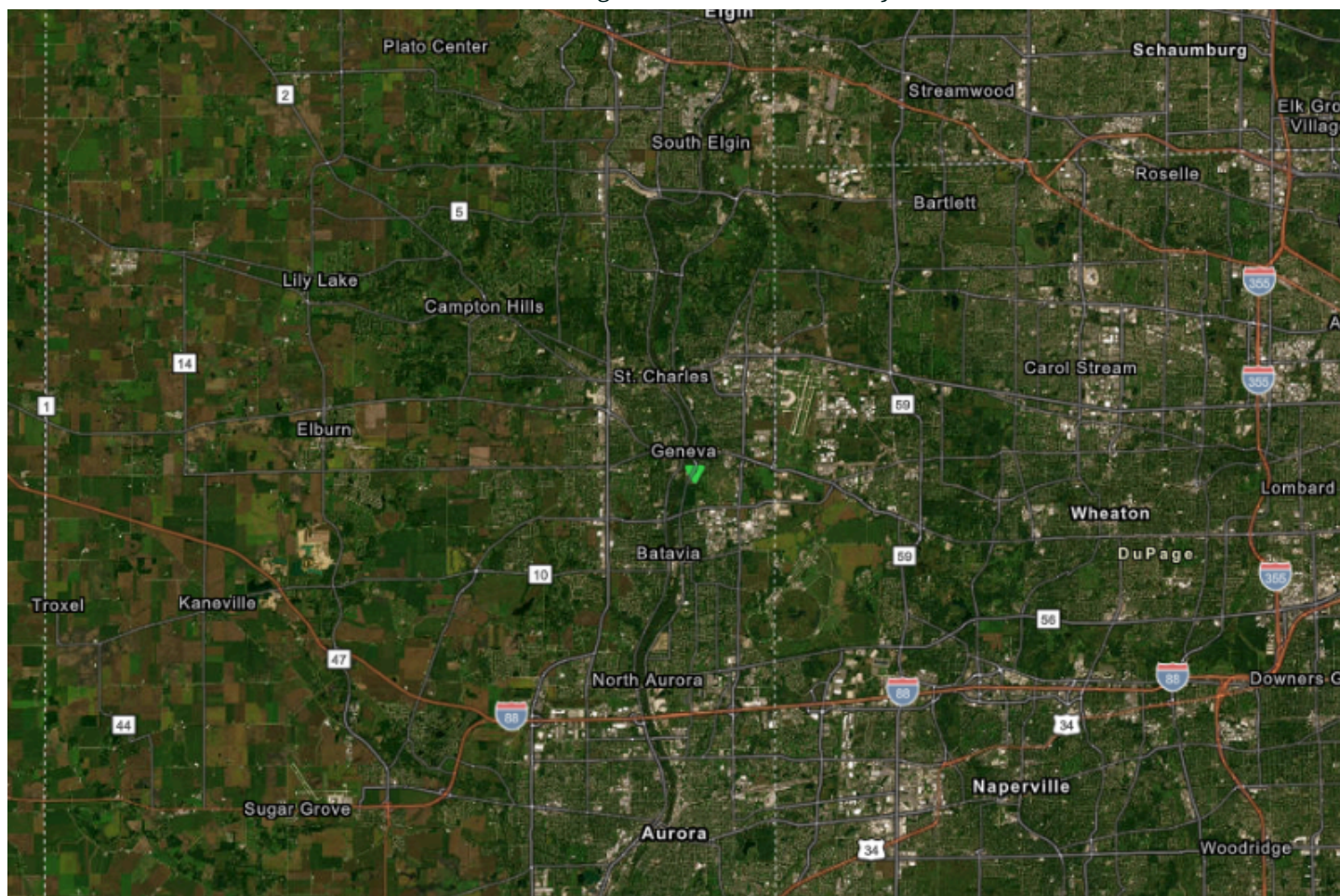


Nearly simultaneously, another storm began producing multiple tornadoes, including one violent tornado, just northwest of the Chicago metropolitan area.

- An F4 tornado began southwest of Crystal Lake, Illinois, around 3:27 PM CST/4:27 PM EST and moved northeast through the city, as well as the Island Lake and Wauconda areas. The most significant damage with this tornado was to a shopping center and residential area just east of the business district.
- An F2 tornado began west of Gurnee around 3:50 PM CST/4:50 PM EST, and continued eastward before ending just north of the city.
- An F1 tornado began a brief path near Waukegan airport at 4:00 PM CST/5:00 PM EST, damaging planes and a few nearby residences.



Extensive tornado damage to a subdivision in Crystal Lake, IL.



South of the Crystal Lake storm, another storm produced a brief tornado---rated F1 on the Fujita Scale---at 4:00 PM CST/5:00 PM EST in the community of Geneva on the far western edge of the Chicago Metropolitan Area.

4:20 PM CST/5:20 PM EST

SELS issued a Tornado Forecast for portions of northern Indiana, southern Michigan, and northwest Ohio. This product was valid from 4:20 PM CST/5:20 PM EST to 8:00 PM CST/9:00 PM EST.

SELS forecasters indicated that scattered severe thunderstorms were expected in this area with large hail, damaging winds, and a couple tornadoes.

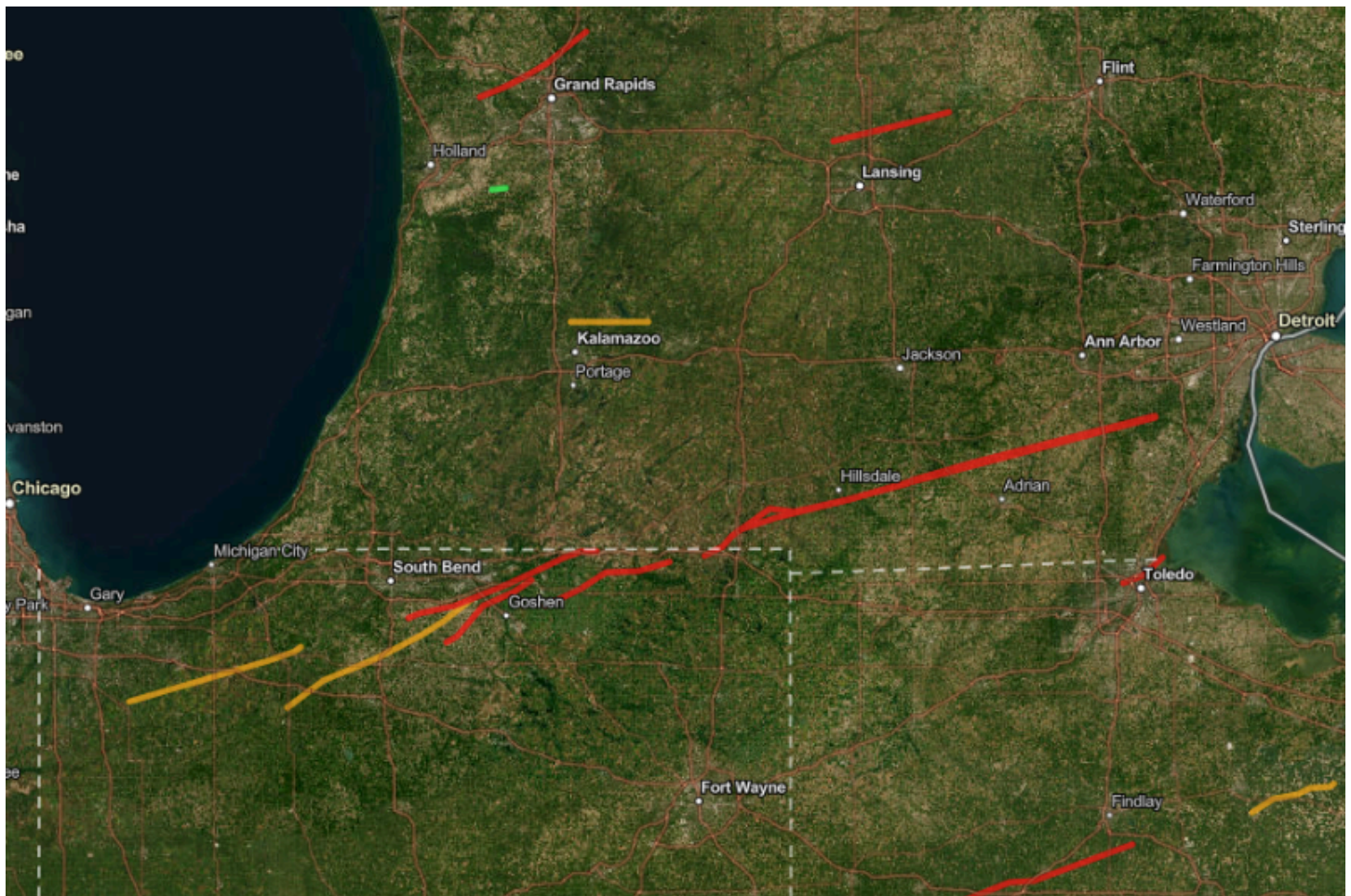


Map showing area highlighted by SELS Severe Weather Forecast #69 issued at 4:20 PM CST/5:20 PM EST, indicating an area at risk for tornadoes.

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SEVERE WEATHER FORECAST NUMBER 69
ISSUED 420 PM CST APRIL 11 1965
U.S. WEATHER BUREAU TORNADO FORECAST FOR...
PORTIONS OF NORTHERN INDIANA
PORTIONS OF SOUTHERN MICHIGAN AND
PORTIONS OF NORTHWEST OHIO

SCATTERED SEVERE THUNDERSTORMS WITH A TORNADO OR TWO LARGE HAIL AND
LOCALLY DAMAGING WIND STORMS ARE EXPECTED IN AN AREA ALONG AND 60 MILES
EITHER SIDE OF A LINE FROM 10 MILES NORTHWEST OF LAFAYETTE INDIANA TO
DETROIT MICHIGAN FROM THE PRESENT TIME TIL 8 PM CST THIS SUNDAY EVENING.
TORNADO FORECAST NUMBER 66 IS CANCELLED.
CRUMRINE.....2230Z
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Text discussion for SELS
Severe Weather Forecast #69.



Radar data suggests that a supercell thunderstorm rapidly developed in northwestern Indiana around 4:00 PM CST/5:00 PM EST. This storm would be responsible for multiple tornadoes as it moved east-northeastward through northern Indiana and southern Michigan.



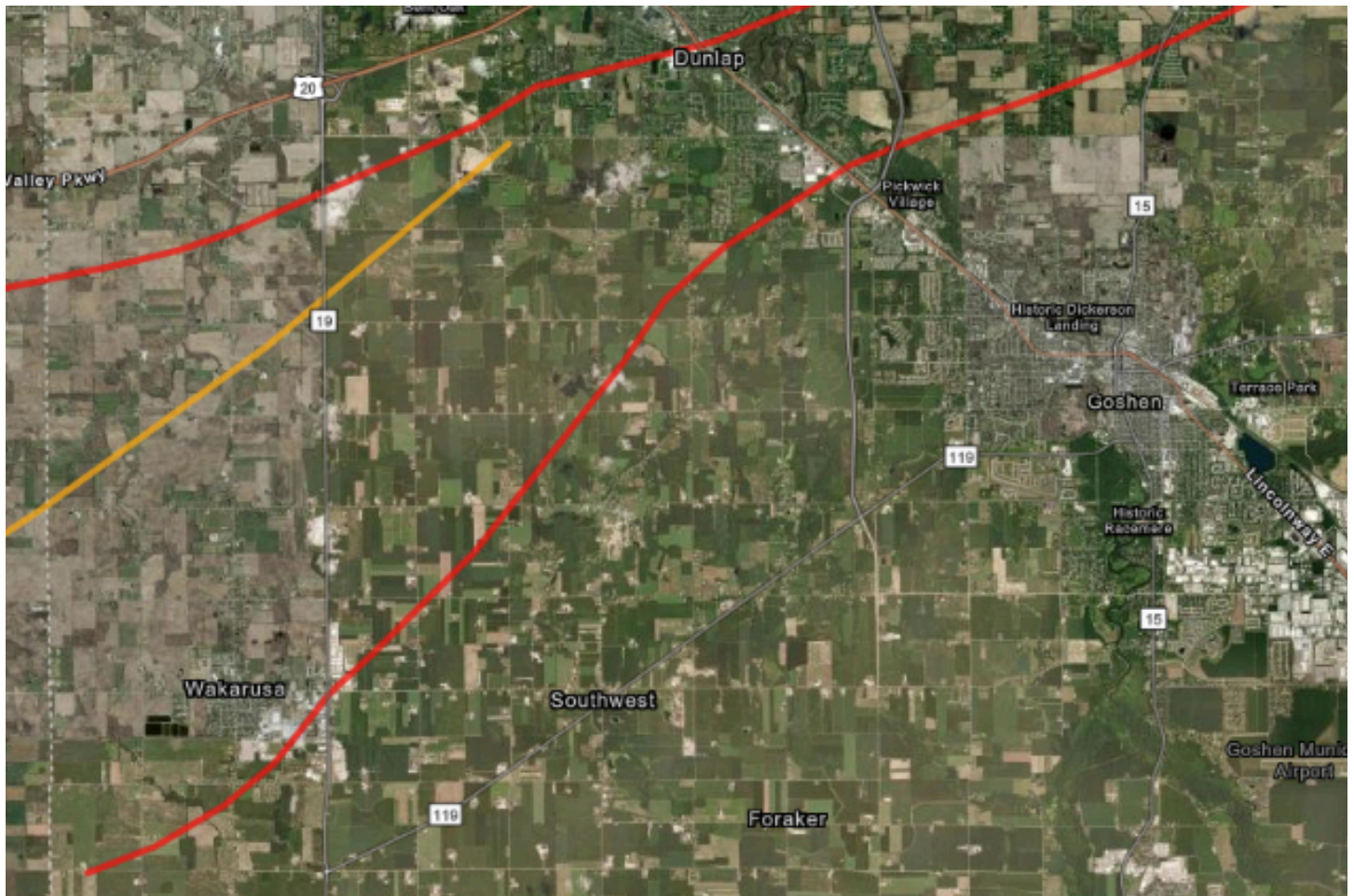
At 4:45 PM CST/5:45 PM EST, the first of four tornadoes that would later impact northern Indiana touched down southeast of Hamlet. Note the proximity of multiple tornado tracks to one another across the area. Some areas of Indiana and Michigan would be impacted by tornadoes from two separate supercell thunderstorms occurring approximately 30 minutes apart.

- A tornado of F3 rating developed near Hamlet, Indiana, west of Plymouth around 4:45 PM CST/5:45 PM EST, then moved east-northeastward toward La Paz, Wyatt, and rural areas south of Elkhart. 30 cottages were destroyed at Koontz Lake. Near La Paz, 6 homes, a church and Lakeville High School were destroyed. 20 homes were destroyed in downtown Wyatt.

This tornado caused 10 fatalities and 82 injuries.



Image of the tornado as viewed from La Paz, IN.



Before the previous tornado dissipated, another significant tornado developed just to the south at 5:15 PM CST/6:15 PM EST.

- A tornado of F4 rating developed near Wakarusa, west of Goshen, then moved northeastward through the Midway area between Elkhart and Goshen. Near Midway, a mobile home community sustained significant damage. Homes near Middlebury were leveled and swept away. This tornado caused 14 fatalities and 200 injuries.



Photo of the tornado captured by a journalist positioned south of its path.



At approximately the same time as the previous tornado dissipated near Middlebury, another significant tornado was forming east of Goshen.

- A tornado of F4 rating developed east of Goshen, around 5:40 PM CST/6:40 PM EST, then moved east-northeastward toward Rainbow Lake and Brighton. Multiple structures were leveled near Rainbow Lake.

This tornado caused 19 fatalities and 100 injuries.



Structure damage occurring along the tornado's path.



About 10 minutes after the previous tornado dissipated near Brighton, the same supercell produced another tornado near

Lake Pleasant, just south of the Indiana/Michigan state line.

- A tornado of F4 rating developed just west of Lake Pleasant, west of Fremont, around 6:10 PM CST/7:10 PM EST, then moved east-northeastward toward Kinderhook, Coldwater Lake, Hillsdale, Devils Lake, Tecumseh, and Milan. This tornado destroyed 200 homes in Branch county, 177 homes in Hillsdale county, and 189 homes in Lenawee county. The Manitou Beach Baptist Church was destroyed, causing dozens of injuries and several fatalities. This tornado caused 44 fatalities and 612 injuries.

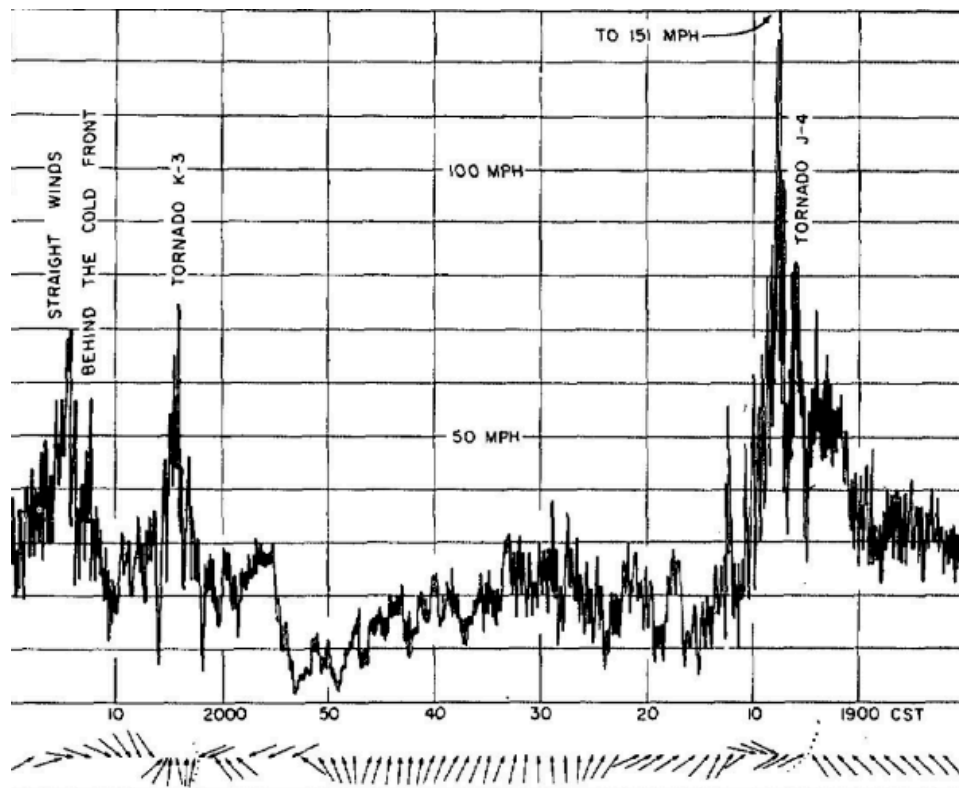
Such a large portion of the areas impacted by this long track tornado would be impacted by yet another tornado just 30 minutes later, that subsequent tornado surveys were unable to determine which damage was caused by which tornado.

"When I opened the door, it was hailing but there was no breeze. I walked back through the kitchen to the dining room as the power went out and that's when it struck. No time to move... When I heard the wood beams start to creak and the maple trees splitting outside, we were in trouble... I flew up in the air between the neighbor's house next door and our house. I landed out in the field. There was no thought in my mind when it was happening. I don't remember seeing or thinking of anything. I don't even know how far into the air I went. I figured I wasn't even breathing because of the vacuum"

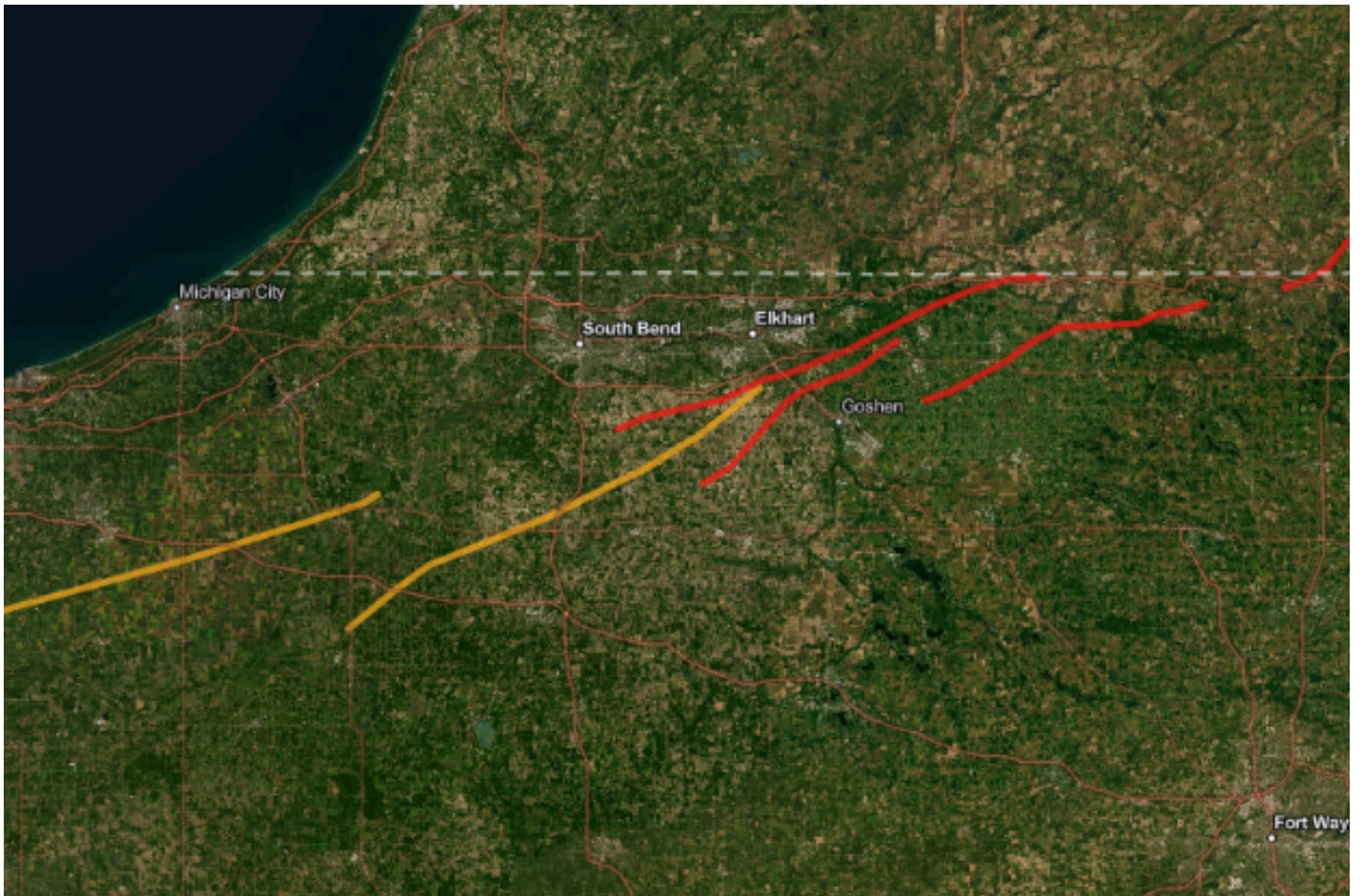
Edna Brinkerhuff, as quoted in *Night of the Wind* by Dan Cherry.



This tornado would hit an experimental wind tower near the Meyers-Divers Airport just north of Tecumseh, Michigan. This equipment measured a 150 mph gust from the south at approximately 7:08 PM CST/8:08 PM EST, the time of tornado passage.



Wind data from an experimental wind tower near Tecumseh, MI.



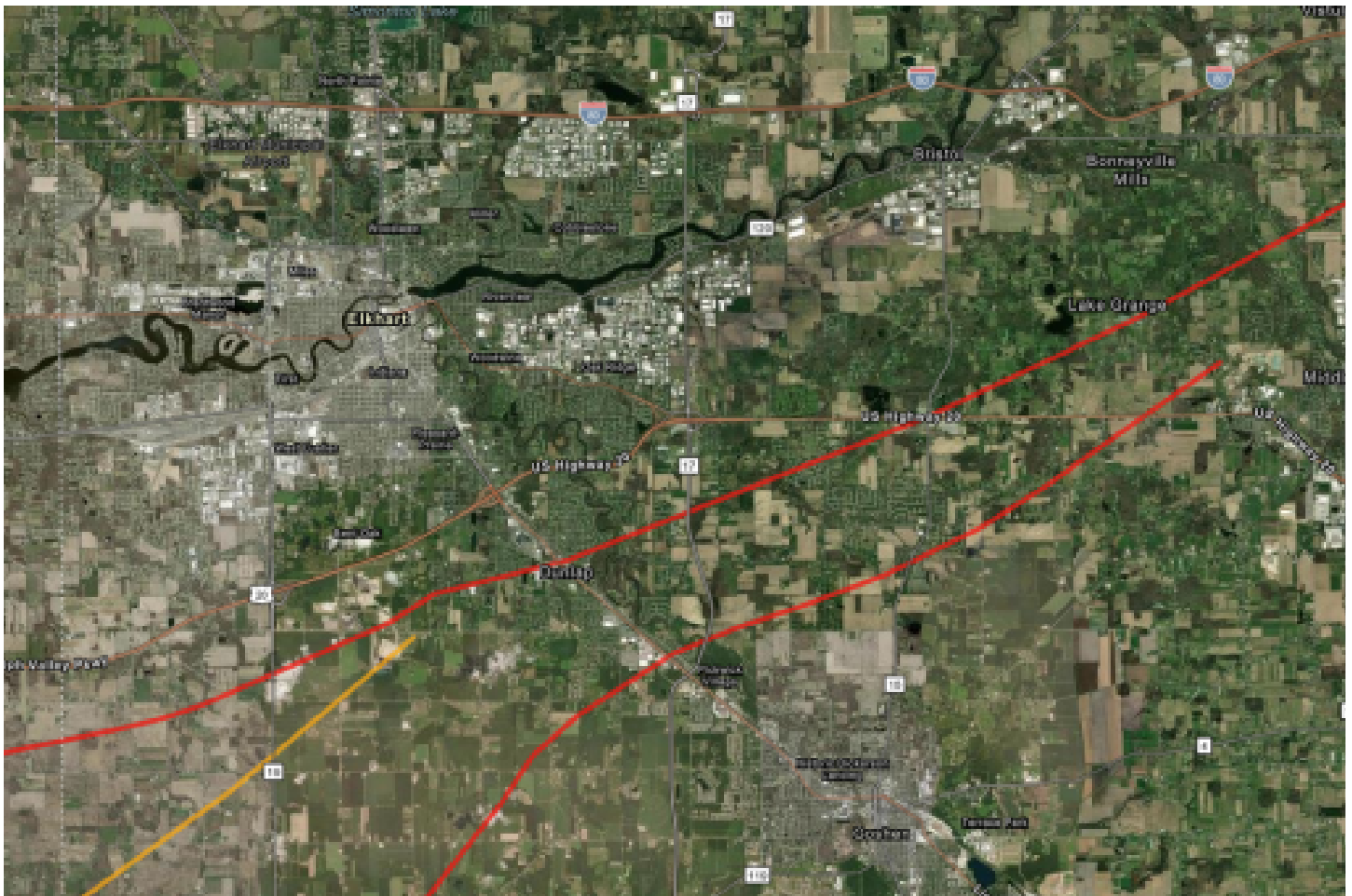
Following just 30 minutes behind the previous supercell, a second supercell thunderstorm formed in northwestern Indiana, becoming tornadic after 5:00 PM CST/6:00 PM EST. This storm produced multiple tornadoes in northern Indiana and southern Michigan, a few of which had similar tracks to tornadoes that occurred in the preceding supercell.



- A tornado of F3 intensity developed just north of Hebron around 5:10 PM CST/6:10 PM EST, then moved east-northeastward toward Wanatah and South Center. This tornado initially produced only very minor damage that was not visible to airplane survey crews, but increased in intensity near Wanatah. Half a dozen homes were destroyed southwest of Wanatah. Homes and barns were destroyed south of Kingsford Heights. This tornado caused 4 injuries.



Tornado as it passed just to the south of Wanatah, IN.



This storm did not produce any tornadoes for approximately the next 30 minutes as it moved quickly eastward through the South Bend/Elkhart area.

- A tornado of F4 rating developed just south of Gulivore Park, south of South Bend, around 6:10 PM CST/7:10 PM EST, then moved east-northeastward toward Dunlap, Hunters Lake, and Scott. The Sunnyside and Kingston Heights housing developments were completely destroyed, with 28 fatalities. A truck stop and home were leveled at the intersection of IN-15 & US-20, with 6 fatalities. This tornado caused 36 fatalities and 320 injuries.

Near Dunlap, this tornado tracked just a couple miles north of the previous tornado that impacted the Midway area.

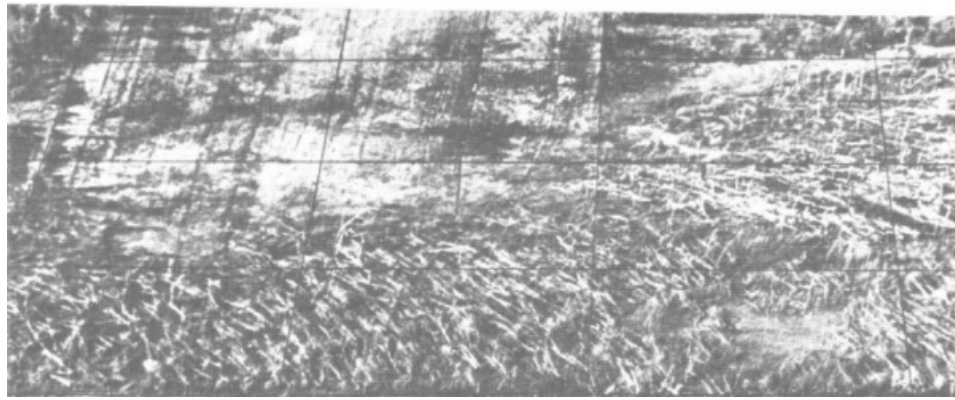


Image of the tornado as it passed just to the north of Dunlap, IN. Damage in foreground is from a tornado impacting the Midway, IN area 30-45 minutes prior.

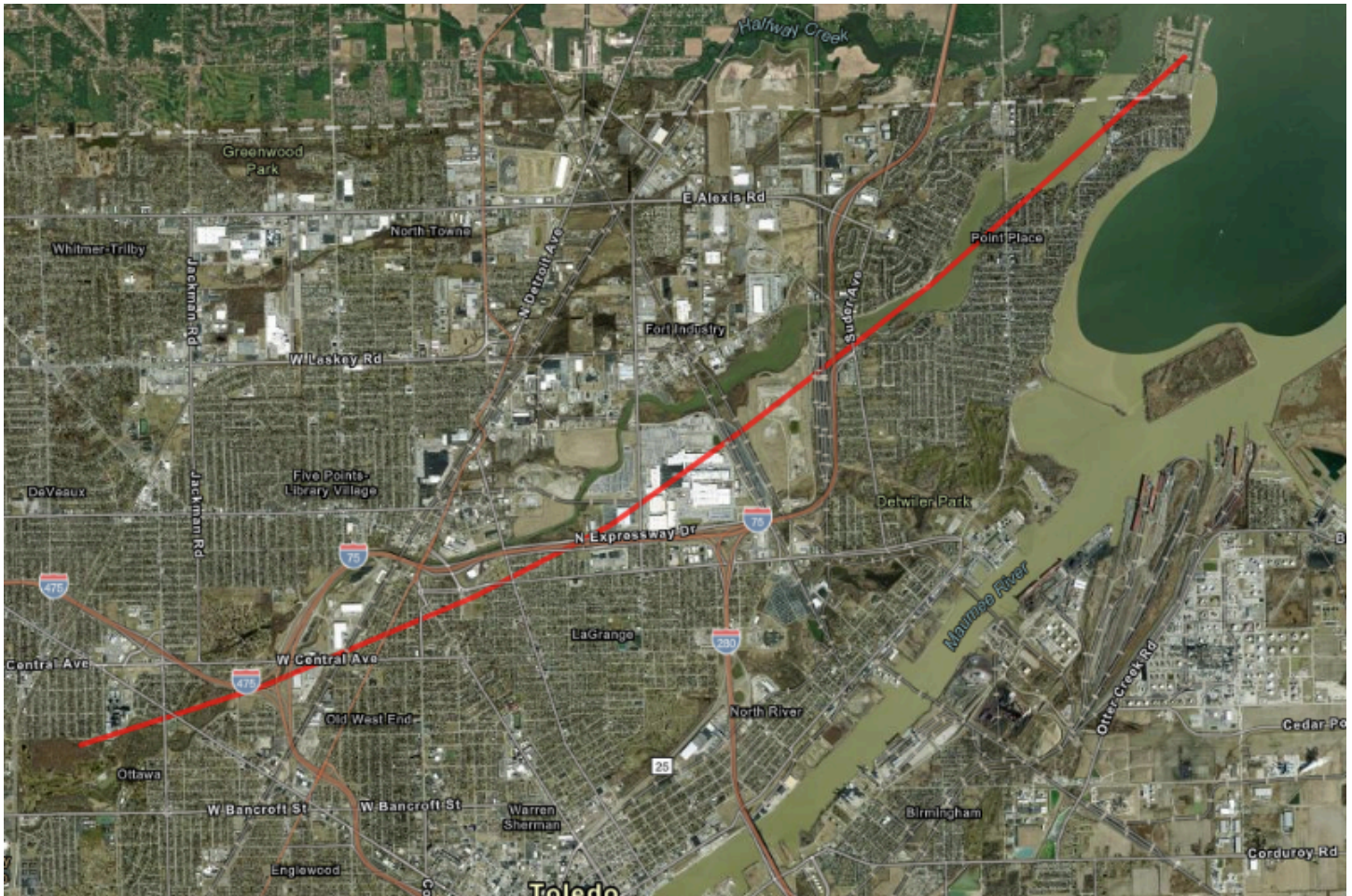


About 15 minutes after the previous tornado dissipated near Scott, a new tornado formed just across the state line in Michigan, coincident with an earlier tornado track from a previous storm.

- A tornado of F4 intensity developed near Coldwater Lake around 6:45 PM CST/7:45 PM EST, then moved east-northeastward so closely to a previous tornado track and damage from each tornado was practically indistinguishable. This tornado also moved toward Hillsdale, Devils Lake, Tecumseh, and Milan. As this tornado passed just north of Tecumseh around 8:04 PM CST/9:04 PM EST, a 74 mph wind gust was recorded at the experimental wind tower near Meyers-Divers Airport.



Flattened trees along the tornado path near Algansee, MI.



A tornado of F4 intensity formed on the northwest side of Toledo, Ohio at approximately 8:30 PM CST/9:30 PM EST. It tracked northeastward toward Lake Erie through the northern edge of the city. 50 homes were destroyed in the Creekside Addition. Cars and boats were reported thrown into and onto buildings. This tornado caused 18 fatalities and 236 injuries.



Image of the tornado as it was moving across the north side of Toledo, OH. Photograph was captured after sunset, with light illumination showing a double funnel structure to the tornado.

6:00 PM CST/7:00 PM EST

SELS issued a Tornado Forecast for a large portion of Michigan. This product was valid from 6:00 PM CST/7:00 PM EST to 8:00 PM CST/9:00 PM EST.

SELS forecasters indicated that scattered severe thunderstorms were expected in this area with large hail, damaging winds, and a couple tornadoes.



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Map showing area highlighted by SELS Severe Weather Forecast #71 issued at 6:00 PM CST/7:00 PM EST, indicating an area at risk for tornadoes.

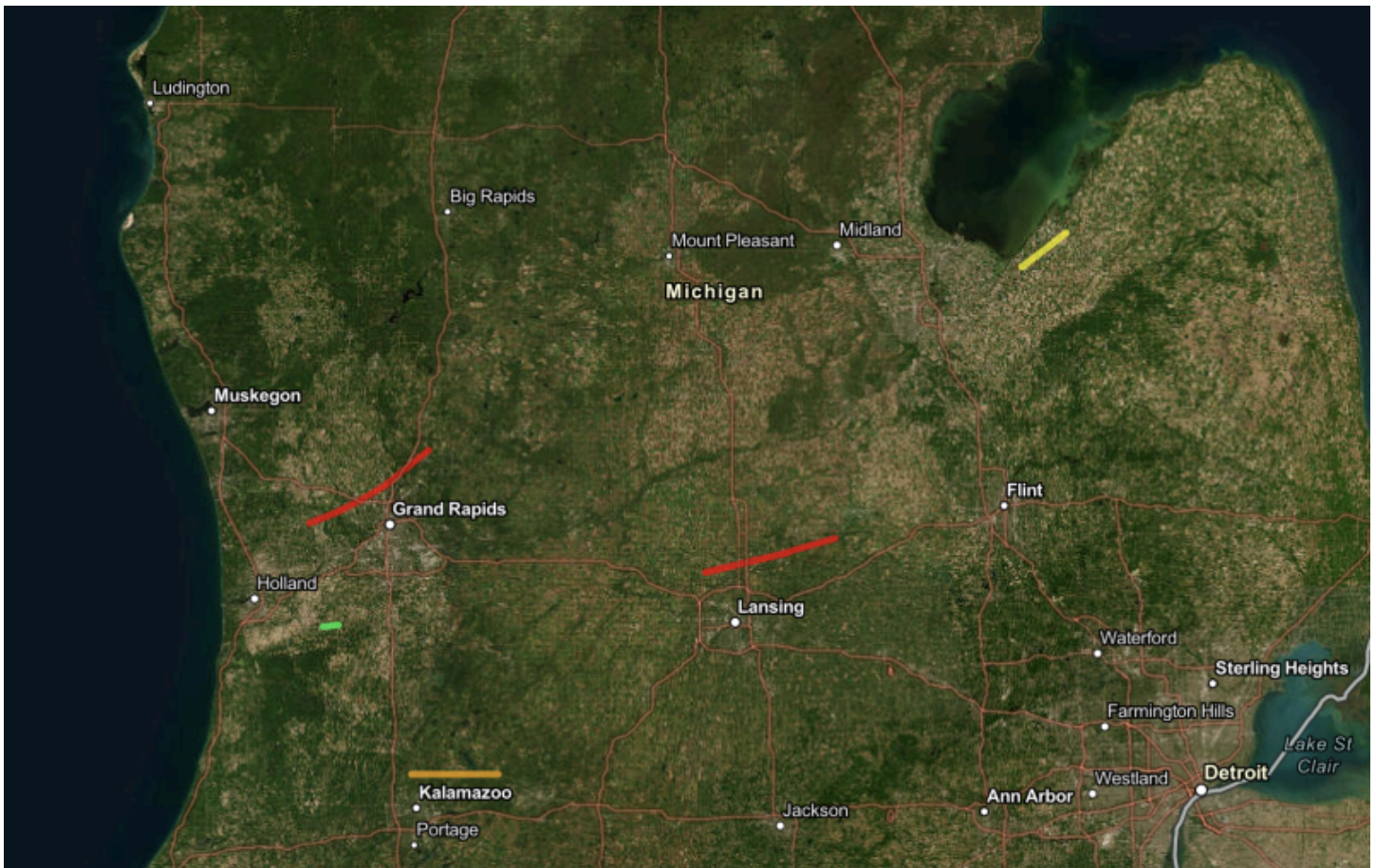
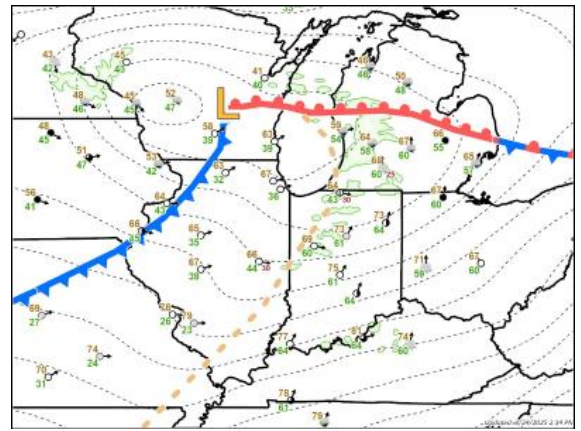
SEVERE WEATHER FORECAST NUMBER 71 120000
ISSUED 6 PM CST APRIL 11 1965
U.S. WEATHER BUREAU TORNADO FORECAST FOR...
PORTIONS OF CENTRAL MICHIGAN
SCATTERED SEVERE THUNDERSTORMS WITH A TORNADO OR TWO LARGE HAIL AND
LOCALLY DAMAGING WIND STORMS ARE EXPECTED IN AN AREA ALONG AND 60 MILES
EITHER SIDE OF A LINE FROM 20 MILES SOUTH OF MUSKOGON MICHIGAN TO 60
MILES EAST OF GLADWIN MICHIGAN FROM THE PRESENT TIME TIL 8 PM CST THIS
SUNDAY EVENING.
CRUMKINE....0009

Text discussion for SELS
Severe Weather Forecast #71.

At 6:00 PM CST/7:00 PM EST, the surface warm front had reached central Wisconsin, but had moved only a few miles to the north in Michigan. The area of low pressure was located in

south central Wisconsin, and the associated dry line had rapidly moved eastward to the eastern shore of Lake Michigan and north central Indiana.

Multiple thunderstorms were ongoing just east of the dry line, extending from western Michigan to central Indiana.



At approximately the same time as the second Indiana supercell was producing tornadoes to the south, thunderstorms began producing tornadoes closer to the warm front and low pressure area in central Michigan.



- A tornado of F4 intensity developed near East Allendale, west of Grand Rapids, around 5:50 PM CST/6:50 PM EST, then moved east-northeastward toward Comstock Park, Alpine, and Rockford.
- A tornado of F1 intensity briefly touched down near Bentham and Burnips, north of Allegan.



Another thunderstorm produced a tornado to the south near Kalamazoo.

- A tornado of F3 intensity developed near Cooper around 6:30 PM CST/7:30 PM EST, then moved eastward toward Richland.



House damage along the Kalamazoo tornado path.



- A tornado of F4 rating developed near DeWitt, north of Lansing, at about 7:05 PM CST/8:05 PM EST, then moved east-northeastward Laingsburg.

- A tornado of F2 intensity developed in rural areas southwest of Unionville at about 8:00 PM CST/9:00 PM EST.

7:10 PM CST/8:10 PM EST

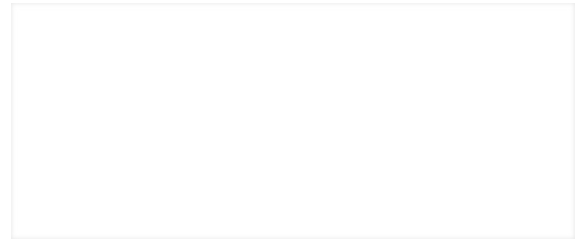
The threat for additional severe thunderstorms to form southward along the dry line was recognized by SELS, which issued a Tornado Forecast for central and eastern Indiana and northwestern Ohio. This product was valid from 8:00 PM CST/9:00 PM EST to 12:00 AM CST/1:00 AM EST.

SELS forecasters indicated that scattered severe thunderstorms were expected in this area with large hail, damaging winds, and a couple tornadoes.



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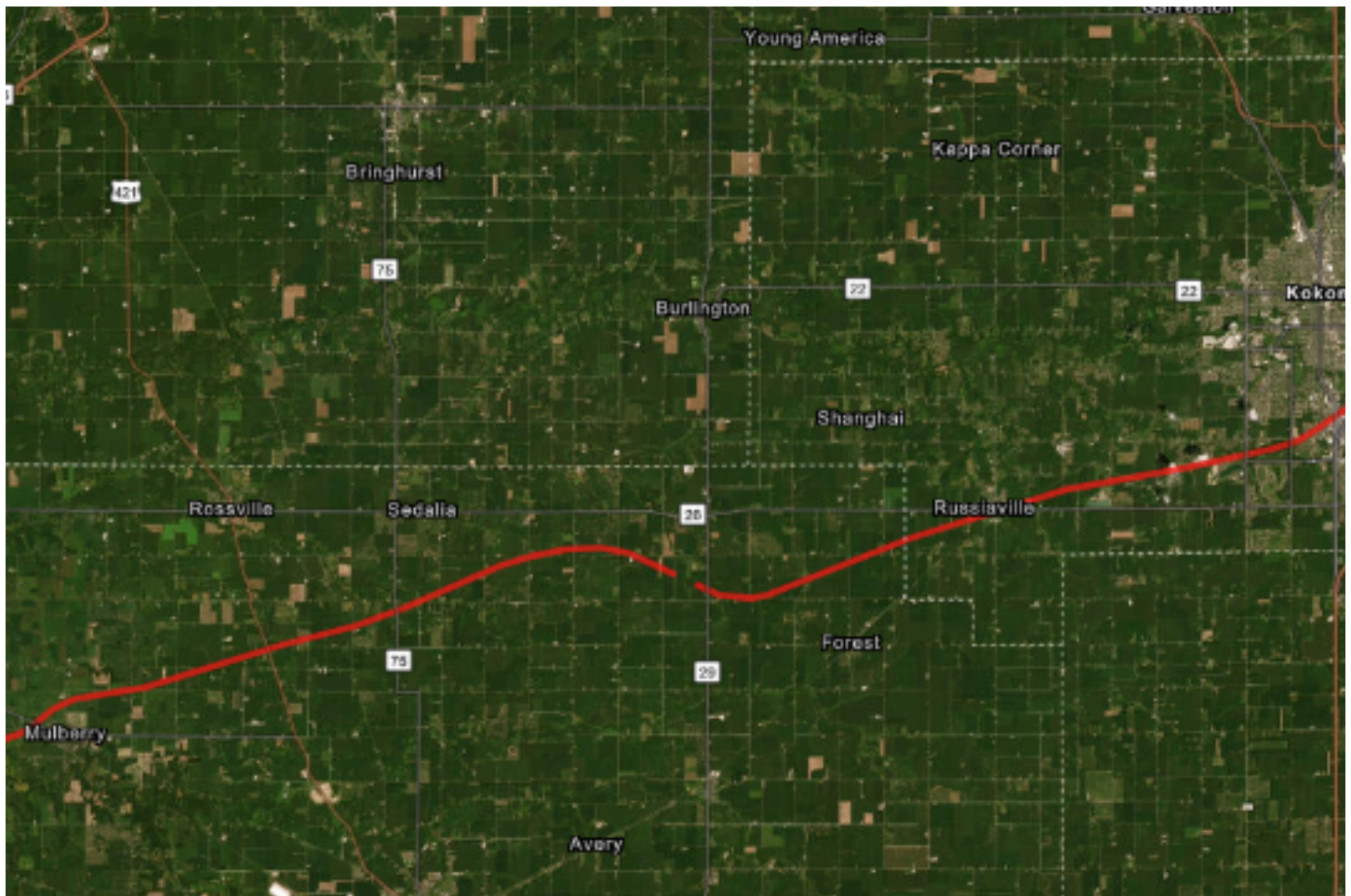
Map showing area highlighted by SELS Severe Weather Forecast #72 issued at 6:00 PM CST/7:00 PM EST, indicating an area at risk for tornadoes.



Text discussion for SELS
Severe Weather Forecast #72.



South of the supercell thunderstorms impacting Michigan and northern Indiana, additional thunderstorms were forming in central Indiana as the clock turned to 6:00 PM CST/7:00 PM EST.



A supercell thunderstorm near Lafayette produced two violent tornadoes along an almost continuous damage path.

- A tornado of F4 intensity developed near Dayton, south of Lafayette, at about 6:07 PM CST/7:07 PM EST, then moved east-northeastward toward Mulberry and Moran areas. Multiple homes and farms were destroyed.



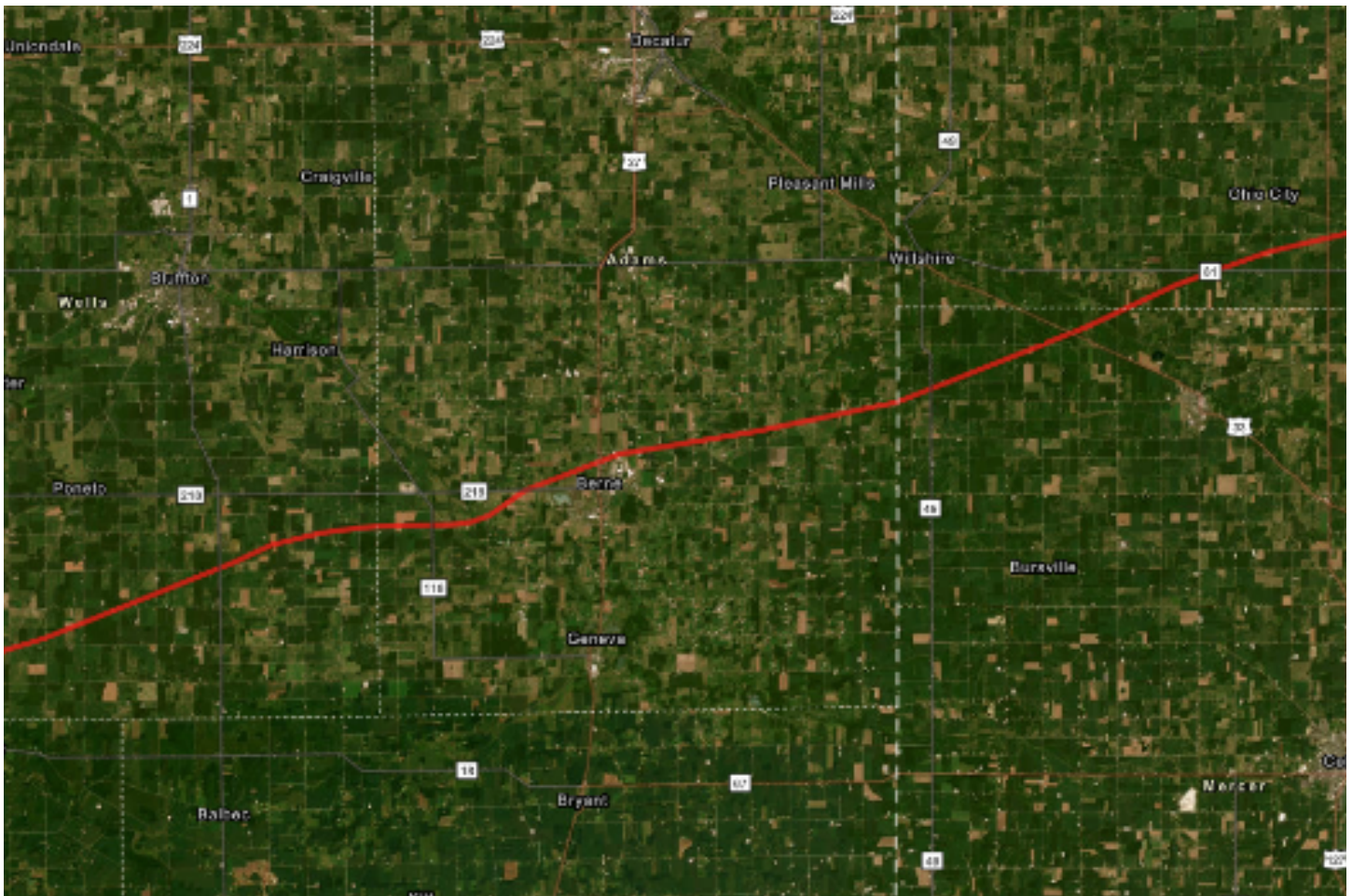
Image of the first tornado as it was passing south of Rossville, Indiana.

- Just after the dissipation of the previous tornado east of Moran, a tornado of F4 intensity developed between Moran and Russiaville at about 6:20 PM CST/7:20 PM EST. The tornado then moved east-northeastward toward Russiaville, Kokomo, Greentown, Swayzee, and Marion areas. Over 90% of the buildings in Russiaville were damaged or destroyed. 100 homes were destroyed at Alto and the south edge of Kokomo. This tornado was most intense when it hit Greentown, where 80 homes were destroyed and 10 people died. The tornado leveled homes and destroyed the Panorama Shopping Center south of Marion. This tornado caused 25 fatalities and 835 injuries.



Russiaville Downtown

Destruction in downtown Russiaville, IN from the second tornado.



The previous tornado dissipated near Arcana, east of Marion, only for another tornado to form shortly thereafter.

- A tornado of F4 intensity developed near Roll, west of Montpelier, at about 7:10 PM CST/8:10 PM EST, then moved east-northeastward toward the Petroleum and Berne areas. The tornado crossed the state line into Ohio near Rockford, and then headed eastward toward the Jonestown area. The hardest hit areas along this tornado track were in Keystone, Linn Grove, and near the Mercer-Van Wert county line south of Willshire, Ohio. This tornado caused 6 fatalities and 90 injuries.

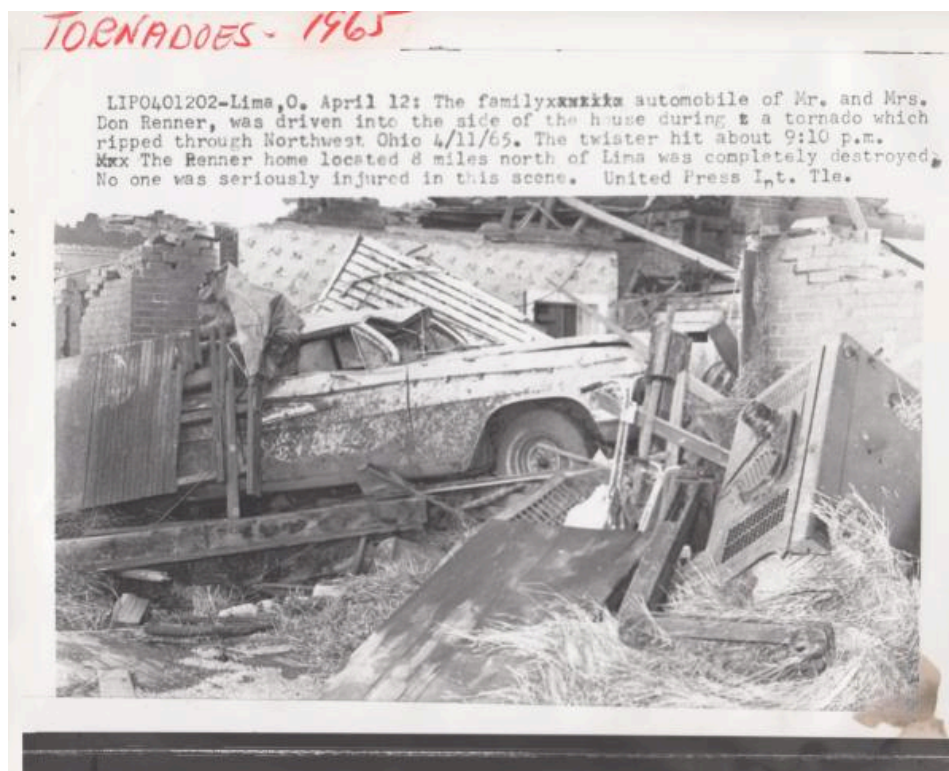


Destroyed bowling alley and lumber yard north of Berne, IN.



The previous tornado dissipated east of Jonestown, with a new tornado forming a few minutes later from the same storm.

- A tornado of F4 intensity developed near Elida, northwest of Lima, at about 8:30 PM CST/9:30 PM EST, then moved east-northeastward toward the Bluffton, and Houcktown areas. Numerous homes were destroyed south of Bluffton, which was the location of the majority of the deaths associated with this tornado. This tornado caused 13 fatalities and 104 injuries.



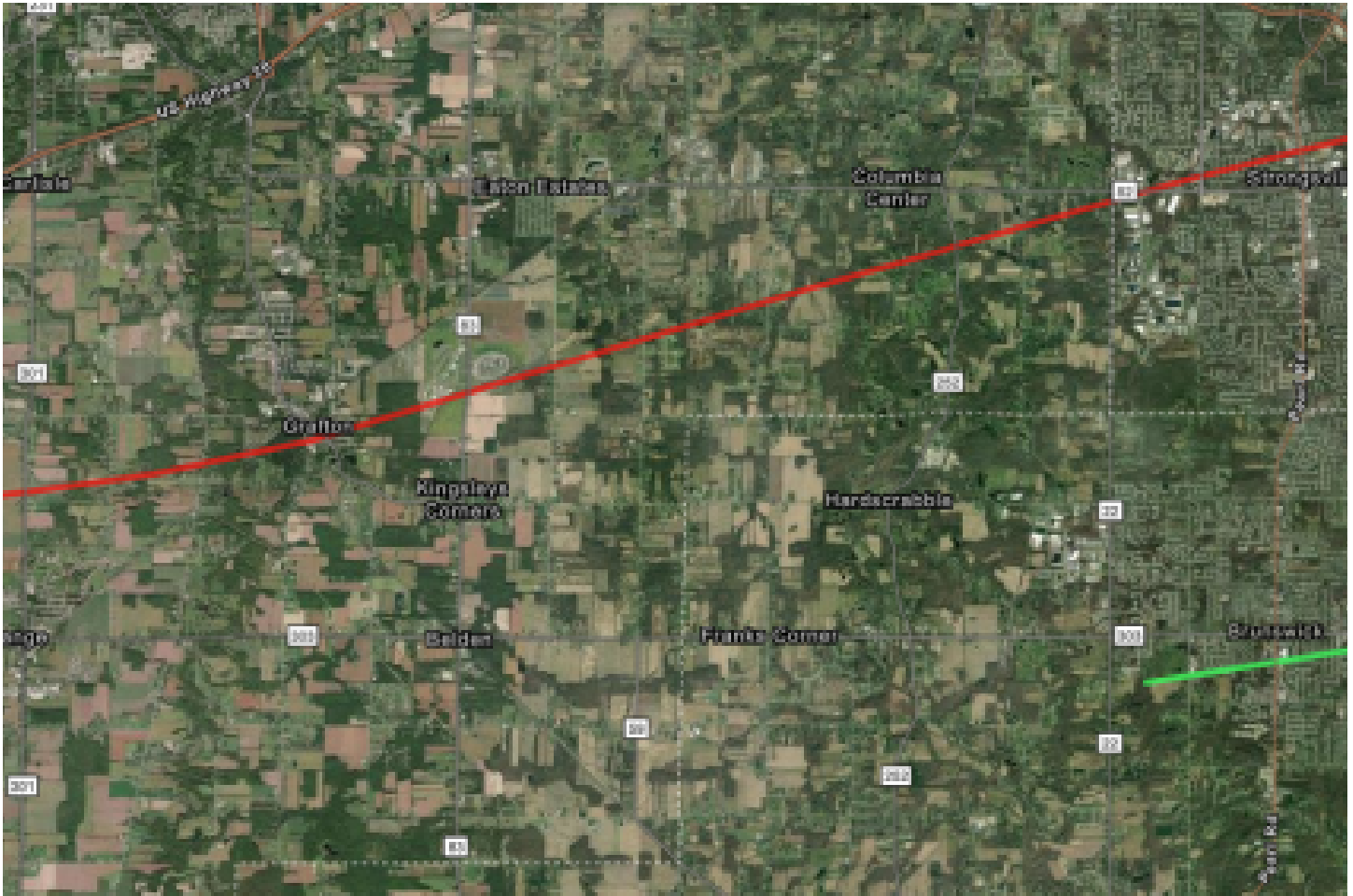
Home damage to the north of Lima, OH.



As the supercell continued east, longer gaps between tornadoes were noted.

- A tornado of F3 intensity developed south of Tiffin at about 9:15 PM CST/10:15 PM EST, then moved east-northeastward toward Rockaway and Scipio. This leveled four homes in the community of Rockway.

This tornado caused 1 fatality and 30 injuries.



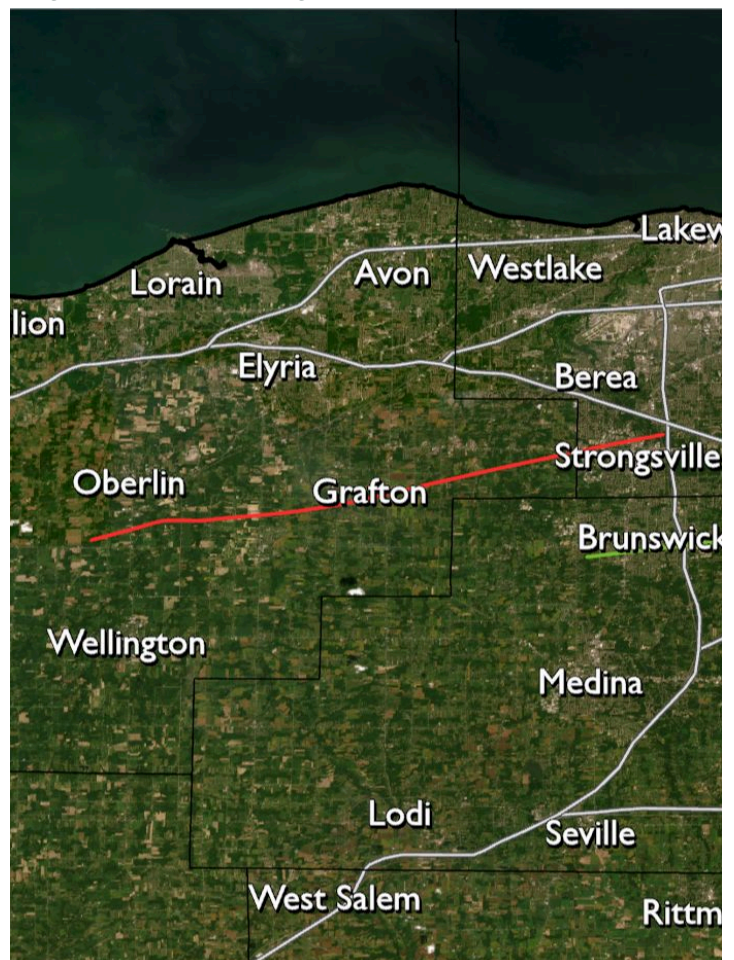
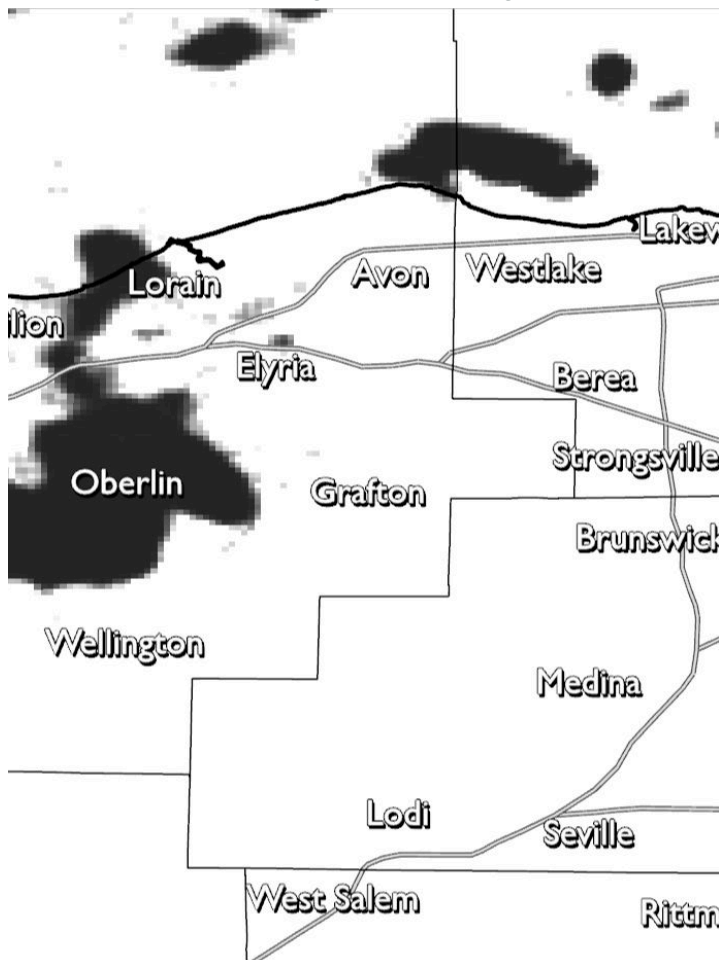
The supercell thunderstorm produced two additional tornadoes as it neared the Cleveland Metropolitan area.

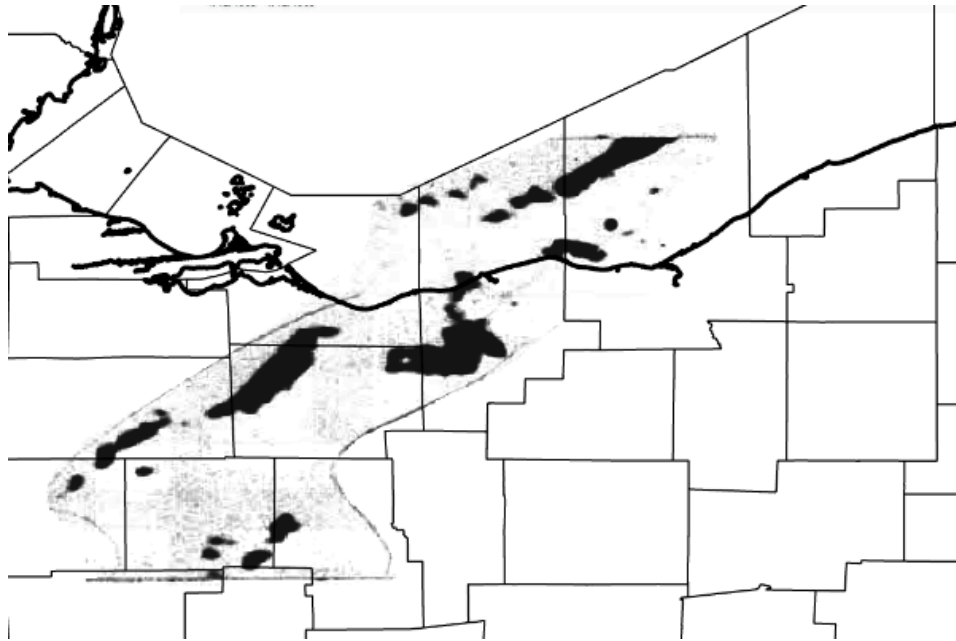
- A tornado of F4 intensity developed near Pittsfield, between Oberlin and Wellington, at about 10:08 PM CST/11:08 PM EST, then moved east-northeastward toward Grafton and Strongsville. Seven of the 50 residents in the small town of Pittsfield died as the entire town was destroyed. In Strongsville, multiple homes were leveled. This tornado caused 18 fatalities and 200 injuries.
- A tornado of F1 intensity developed near Brunswick at about 10:30 PM CST/11:30 PM EST and was on the ground

briefly. One home was destroyed and several severely damaged in Brunswick.

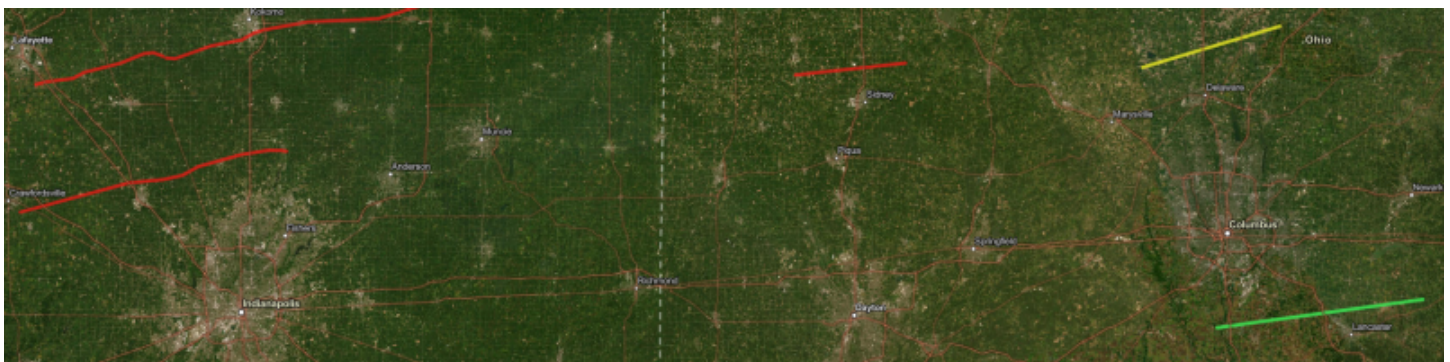


Newspaper clipping from the Columbus Dispatch showing significant damage to a residential neighborhood in Strongsville, OH.

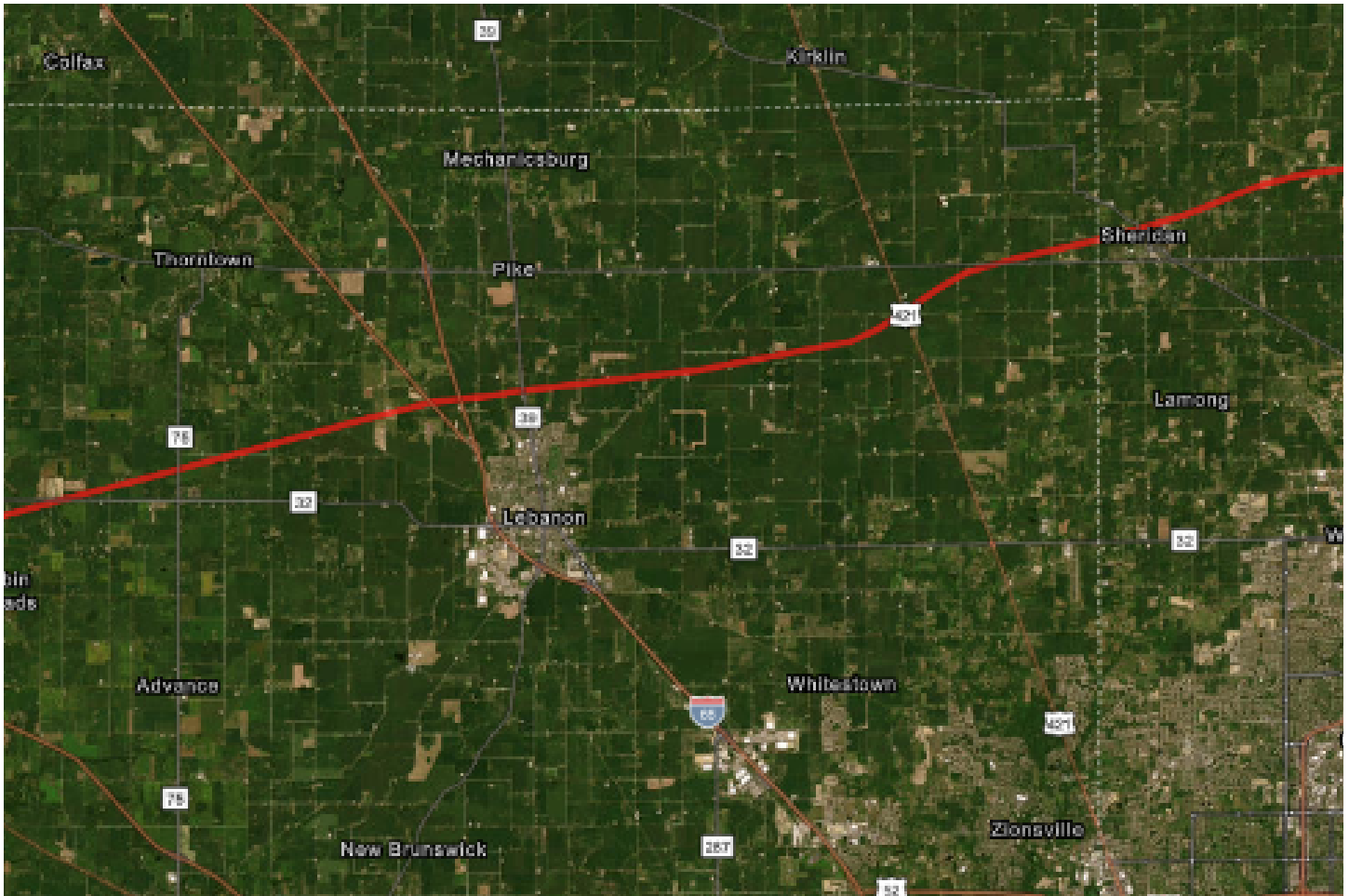




Georeferenced radar image from Akron weather radar (CAK) valid at 0400 UTC on April 12, 1965 (10:00 PM CST/11:00 PM EST on April 11) showing tornadic supercell just prior to tornado formation southwest of Oberlin.



South of the storms responsible for strong to violent tornadoes from Lafayette, Indiana to Cleveland, Ohio, yet another area of cells would produce the southernmost tornadoes of the April 11 outbreak following 6:30 PM CST/7:30 PM EST.



An F4 tornado formed just to the southeast of Crawfordsville, IN at 6:35 PM CST/7:35 PM EST, and moved to the east-northeast toward the Shannondale, Sheridan, and Arcadia areas. The tornado cut a mile wide swath of damage through the north side of Lebanon, destroying 54 homes and killing 11, of which 6 were from a single family. 4 died in vehicles and 10 more were killed as 25 homes were destroyed in the Sheridan area.

This tornado caused 28 fatalities and 123 injuries.



Substantial damage to a home in the community of Lafollette, IN.



A tornado of F4 intensity formed in Fort Laramie, Ohio, at about 9:00 PM CST/10:00 PM EST, then moved eastward

toward the community of Maplewood. The small town of Swanders was essentially destroyed with 24 homes flattened. 53 cars of a 68 car train were derailed near town. This tornado caused 3 fatalities and 50 injuries.



Aerial view of farm damage near Fort Laramie, OH.



A tornado of F2 intensity developed near Magnetic Springs, north of the Columbus Metropolitan Area, at about 10:30 PM CST/11:30 PM EST, then moved northeastward toward the Radnor, Westfield, and Fulton areas. All deaths occurred in Radnor with 22 people injured in Westfield. This tornado caused 3 fatalities and 62 injuries.



A tornado of F1 intensity developed near South Bloomfield, south of the current-day Columbus Rickenbacker International Airport, at about 11:30 PM CST/12:30 AM EST, then moved east-northeastward Wesley Chapel and Oakthorpe areas.

10:30 PM CST/11:30 PM EST

SELS believed that the threat for severe thunderstorms would continue as the dryline moved eastward through Ohio. They issued a Tornado Forecast for most of Ohio and western Pennsylvania. This product was valid until 6:00 AM CST/7:00 AM EST.

SELS forecasters indicated that scattered severe thunderstorms were

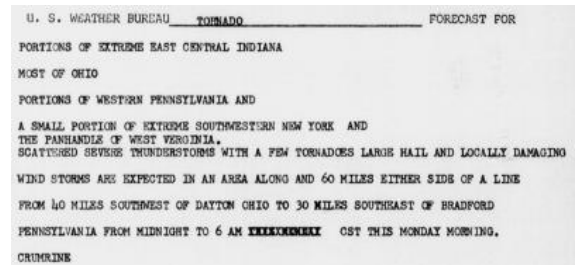


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Map showing the area highlighted by SELS Severe Weather Forecast #73 issued at 10:30 PM CST/11:30 PM EST, indicating an area at risk for tornadoes.

expected in this area with large hail, damaging winds, and a few tornadoes.

Tornado activity waned prior to the start time of this tornado forecast, however. The last known tornadoes associated with this storm system occurred in northern and central Ohio just prior to 12:00 AM CST/1:00 AM EST.



Text discussion for SELS
 Severe Weather Forecast #73.

Aftermath

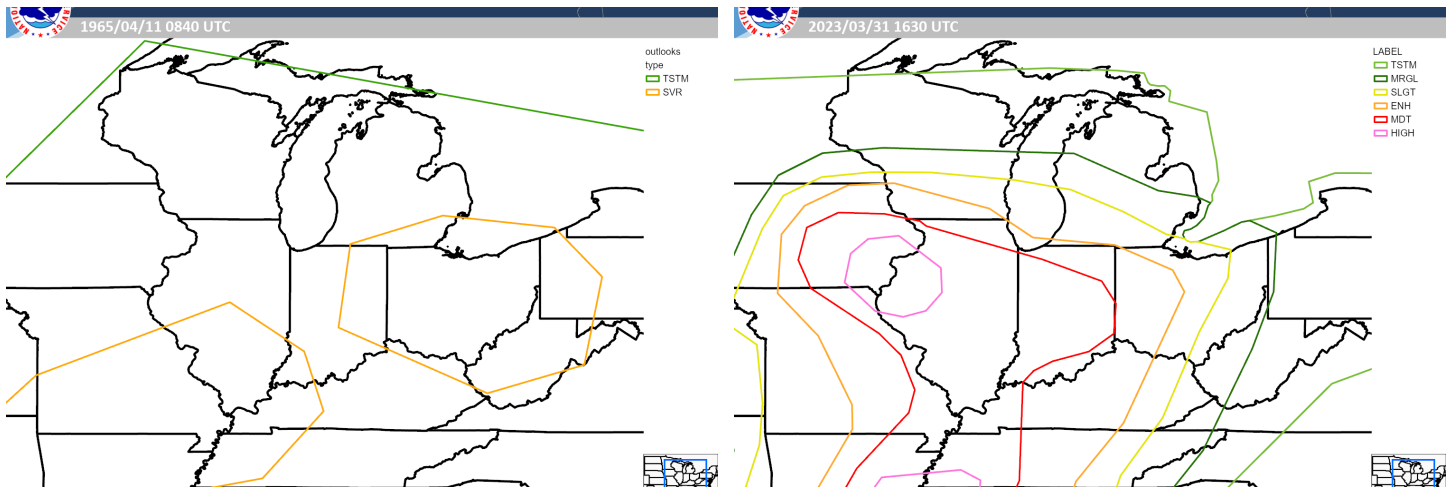
Improvements to Forecasts, Warnings, and Preparedness

In 1965, Tornado Forecasts were issued if conditions were favorable for tornadoes or a Tornado Warning if a tornado had been positively identified. The survey team learned that many people were confused about the difference; they simply thought a warning was an “update” to the Tornado Forecast. To help prevent confusion, the term “Tornado Forecast” was changed to “Tornado Watch”, a term still in use to this day.

Additionally, given that many people were outside enjoying the warm, weekend weather, people were not monitoring radio or television broadcasts that may have provided warnings for severe weather occurring that day. In response, many communities repurposed their Civil Defense sirens to be used as an outdoor warning mechanism.

Since 1965, outlooks for areas of thunderstorms and severe weather have also improved significantly. Contrary to today's severe weather outlooks, which use a 5-level scale for severe weather probability and can indicate specific portions of states with favorable weather conditions for severe storms up a week in advance, only two areas were indicated in such

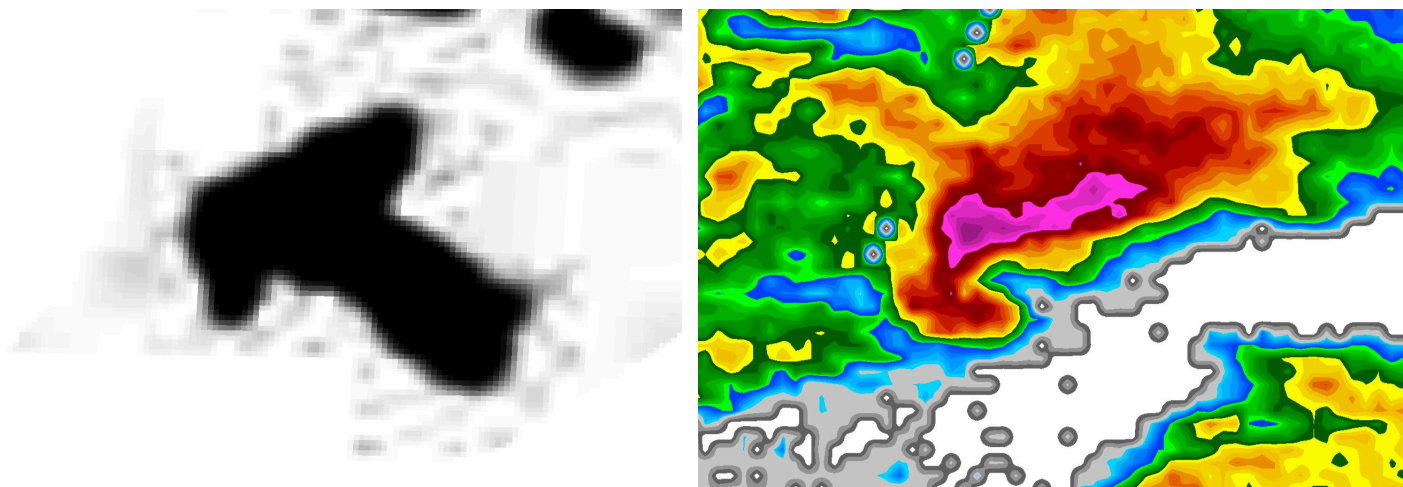
forecasts in 1965 - an area favorable for thunderstorm activity and an area favorable for severe thunderstorms - and outlooks only covered the period of time 24 hours into the future.



Two outlooks for severe thunderstorms issued by the National Weather Service (or its predecessor agency) for the Midwest region. The map on the left depicts a recreation of the thunderstorm outlook for April 11, 1965, issued at 0840 UTC that morning. The map on the right depicts the thunderstorm outlook for March 31, 2023, issued at 1630 UTC that day.

Improvements to Weather Radar

Since 1965, there have been numerous advances in weather radar technology. In 1965, weather radars only indicated "precipitation" or "no precipitation," with a much more limited ability to determine relative intensity of precipitation. Early radars also were unable to see the movement of precipitation toward or away from the radar site (doppler radar), nor were they able to determine the shape of targets to indicate potential tornadic debris (dual-polarization). Radar technicians were primarily looking for hook echos on radar, a pattern discovered about a decade earlier, that signals a thunderstorm is rotating and may produce a tornado.



Two radar images of a supercell thunderstorm at approximately the same scale, showing advances in radar technology. The monochromatic image on the left is of a supercell thunderstorm near Lafayette, Indiana, observed by the Champaign, Illinois, research radar (CMD) at 2356 UTC on April 11, 1965. The image on the right is of a supercell thunderstorm west of Coldwater, Michigan, as observed by the North Webster, Indiana, NEXRAD (IWX) at 2201 UTC on May 7, 2024.

Story map contributors

Scott Lincoln (NWS Chicago), Jaclyn Anderson (NWS Detroit), Ernest Ostuno & Thomas Turnage (NWS Grand Rapids), Andrew Quigley, Michaela Heeren & Taylor Patterson (NWS Milwaukee), Todd Holsten (NWS Northern Indiana)

First-hand tornado accounts

Night of the Wind, by Dan Cherry

Tornado tracks, survey information, and detailed analysis of the event

Fujita, T.T., D.L. Bradbury, and C.F.V. Thullenar, 1970: Palm Sunday Tornadoes of April 11, 1965. *Mon. Wea. Rev.*, **98**, 29-69, [https://doi.org/10.1175/1520-0493\(1970\)098<0029:PSTO-A>2.3.CO;2](https://doi.org/10.1175/1520-0493(1970)098<0029:PSTO-A>2.3.CO;2).

NWS Chicago write-up	https://www.weather.gov/lot/Palm_Sunday_Outbreak
NWS Detroit write-up	https://www.weather.gov/dtx/palmsunday
NWS Indianapolis write-up	https://www.weather.gov/ind/palmsuntor
NWS Northern Indiana write-up	https://www.weather.gov/wx/1965_palmsunday_50